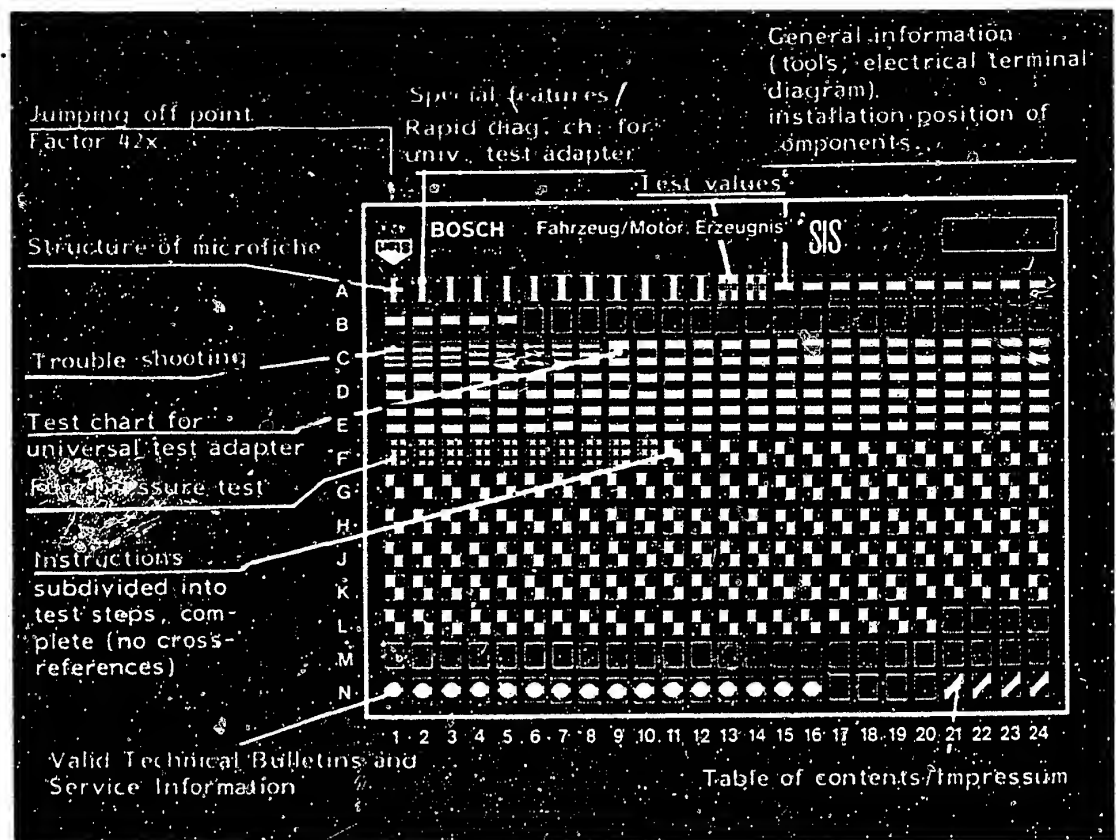
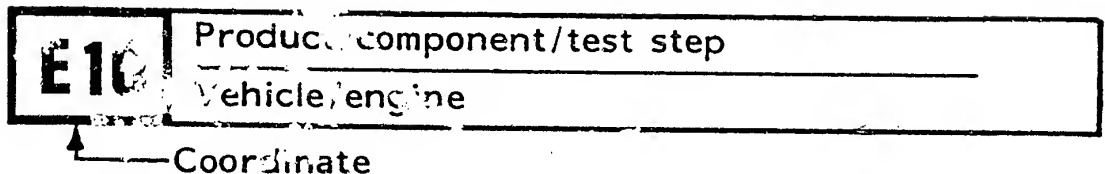


## Structure of microfiche



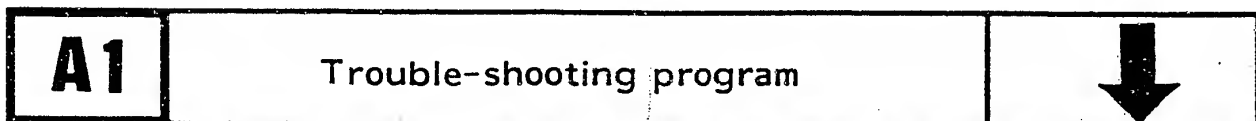
1. Read from left to right
2. Title of microfiche (appears on each coordinate)



3. Limits of section



4. Purely vehicle-specific passages in the text are marked with a vertical bar.
5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.



## SPECIAL FEATURES

- Model for USA/Japan with lambda closed-loop control, 3-way catalytic converter, and idle speed control
- Digital LH-control unit
- Hot-wire air-mass sensor instead of an air-flow sensor
- Start-control
- Adaptive overrun cutoff
- A main and pump relay are installed instead of a control relay
- An idle actuator is installed instead of an auxiliary-air device.

The control unit and the peripheral equipment are tested in the test with the universal test adapter (special LH2-adapter lead)

8.82 - 7.83: Control unit 0 280 000 503

From 8.83 - 7.84: Control unit 0 280 000 510

## RAPID DIAGNOSTIC CHART FOR THE UNIVERSAL TEST ADAPTER

The rapid diagnostic chart below makes it possible for the experienced L-Jetronic expert to check quickly the electrical portion of the system using the universal test adapter.










The rapid diagnostic chart contains the following information:

- Sequence of test steps
- Setting of the V and  $\Omega$  program switches
- Notes on the operation of the universal test adapter or other components
- Test specifications for the motortester and multi-meter
- Indication of the coordinates for the pertinent detailed testing and trouble-shooting program.

If detailed information and instructions are required, proceed in principle according to the trouble-shooting chart starting from Coordinates C1/C2.



# Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		Measurement	Note	Test specifications	For trouble-shooting, see Coordinates
	V	$\Omega$			(Reading)	
1		5	Resistance of the temperature sensor NTC II on the control unit plug between Term. 2 and Term. 11.	Connect adapter lead only to periphery.	(+15°C...+30°C): 1300...3600 $\Omega$ (+ 80°C): 250...390 $\Omega$	C 14
2		6	Resistance, ground - output stage on the control unit plug between Term. 25 and Term. 11.	Connect adapter lead only to periphery.	0...10 $\Omega$	C 16
3		8	Resistance of all 4 solenoid-operated injection valves connected in parallel and the electric fuel pumps in series on the control unit plug between Term. 13 and Term. 11.	Connect adapter lead only to periphery.	(+15°C...+30°C): 8.50...11.0 $\Omega$ (+ 80°C): 8.70...11.5 $\Omega$	C 18
4		9	Resistance of the idle contact in the throttle valve switch on the control unit plug between Term. 3 and Term. 11.	Connect adapter lead only to periphery. Accelerator pedal in at rest position.	0...10 $\Omega$	C 21
5		10	Resistance of the full load contact in the throttle valve switch on the control unit plug between Term. 12 and Term. 11.	Connect adapter lead only to periphery. Step down all the way on the accelerator pedal (full load setting).	0...10 $\Omega$	C 23
6		11	Resistance of the idle actuator (1st coil) and the electric fuel pump on the control unit plug between Term. 10 and Term. 11.	Connect adapter lead only to periphery.	(+15°C...+30°C): 20...32 $\Omega$ (+ 80°C): 24.5...37.0 $\Omega$	D 1
7		12	Resistance of the idle actuator (2nd coil) and the electric fuel pump on the control unit plug between Term. 23 and Term. 11.	Connect adapter lead only to periphery.	(+15°C...+30°C): 18...29.5 $\Omega$ (+ 80°C): 22...34 $\Omega$	D 3
8		13	Idle speed control test pin (2-pole plug) near the ignition coil, resistance on the control unit plug between Term. 15 and Term. 11.	Connect adapter lead only to periphery. Ground test pin (blue/white lead).	0...10 $\Omega$	D 5
9		21	Potentiometer for idle-mixture adjustment, resistance on the control unit plug between Term. 14 and Term. 6	Connect adapter lead only to periphery, dependent on the CO-adjustment	10...1100 $\Omega$	D 7

**A3**

Rapid diagnostic chart

Volvo 240


**A4**

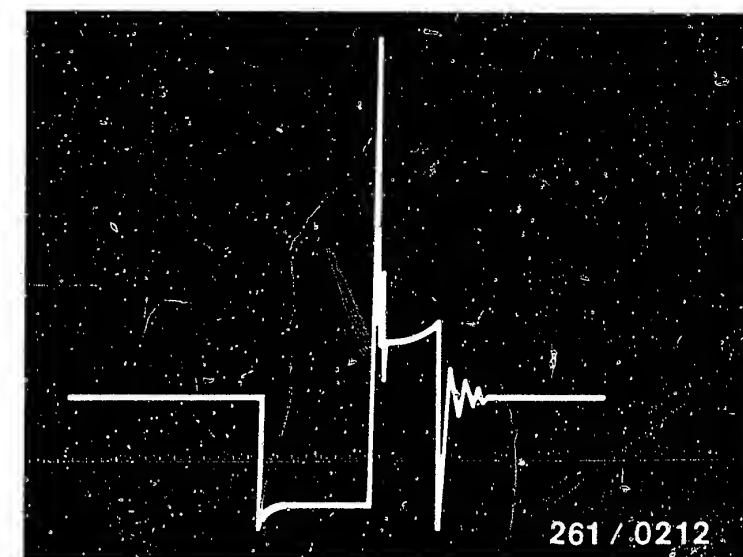
Rapid diagnostic chart

Volvo 240



# Rapid diagnostic chart for the universal test adapter

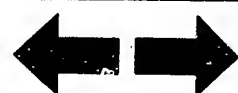
Test step	Switch setting		But-ton	Measurement	Note	Test speci-fications	For trouble-shooting, see Coordinates
	V	Ω					
10	4	21		Voltage from starting motor Term. 50. On the control unit plug between Term.4 and Term. 11.	Connect adapter lead only to periphery. Shift in-to neutral, start engine.	8 ... 15 V	D 9
11	5	21		Voltage pulses from the ignition coil Term. 1. On the control unit plug between Term. 1 and Term. 11.	Connect adapter lead only to periphery. Ignition "ON". Measure primary signal with oscilloscope. Shift into neutral and start engine.	See Fig. at top	D 11
12	6	21	4	Voltage from the main relay Term. 87. On control unit plug between Term.9 & Term.11.	Connect adapter lead only to periphery. Ignition "ON".	8 ... 15 V	D 13
13	7	21		Voltage from the ignition coil Term.15. On con-trol unit plug between Term.18 & Term. 11.	Connect adapter lead only to periphery. Ignition "ON".	8 ... 15 V	D 15
14	8	21		Voltage on the main relay (coil) Term.21. On the control unit plug between Term.21 & Term. 11.	Connect adapter lead only to periphery. Ignition "ON".	8 ...15 V	D 17
15	9	21		Voltage on the pump relay (coil) Term.17. On the control unit plug between Term.17 & Term. 11.	Connect adapter lead only to periphery. Ignition "ON".	8 ... 15 V	D 19



Signal from Term. 1  
(Primary signal)

**A5**

Rapid diagnostic chart  
Volvo 240



**A6**

Rapid diagnostic chart  
Volvo 240





# Rapid diagnostic chart for the universal test adapter

Test step	Switch Setting		But-ton	Measurement	Note	Test specifi-cations	For trouble-shooting, see Coordinates
	V	$\Omega$				(Reading)	
16	10	21		Voltage at the air conditioner switch (if there is one). On the control unit plug between Term. 16 and Term. 11.	Ignition "OFF". Also connect to control unit. Ignition "ON". Run the engine. Switch the air conditioner on.	<u>8 ... 15 V</u>	D 21
17	3	21		Output voltage from the hot-wire air-mass sensor. On the control unit plug between Term. 7 and Term. 6.	Connect adapter lead to control unit and periphery. Have the engine run. With a change in engine speed, the output voltage must also change.	<u>2 ... 5 V</u>	D 23
18	11	21		Measurement of voltage, lambda closed-loop control open-loop control value. On the control unit plug between Term. 22 and Term. 11.	Connect adapter lead to control unit and periphery. Have engine run at normal operating temperature. Settings 22, 23, and 24 are not allowed for the $\Omega$ switch. Take apart the connection in the sensor lead.	<u>1 ... 3 V</u>	E 1
19	11	22		Measurement of voltage, lambda closed-loop control (rich value). On the control unit between Term. 22 & Term. 11.	Connect adapter lead to control unit and periphery. Have the engine run at normal operating temperature.	<u>2 ... 3.5 V</u>	E 3
20	11	23		Measurement of voltage, lambda closed-loop control (lean value). On the control unit plug between Term. 22 & Term. 11.	Connect adapter lead to periphery and control unit. Have engine run at normal operating temperature.	<u>Less than 0.5 V</u>	E 5
21	11	24		Measurement of voltage, lambda closed-loop control (closed-loop control value). On the control unit plug between Term. 22 & Term. 11.	Connect adapter lead to control unit and periphery. Have engine run at normal operating temperature.	<u>0 ... 3 V</u> Alternating between the large and small values.	E 7
22	11	24	3	Basic setting for idle	Connect adapter lead to periphery and control unit. Have engine run at normal operating temperature. Press button 3. Take reading for speed on motortester. Loads switched off. (1) value when button 3 is not pressed.	<u>650...700 min<sup>-1</sup></u>  (1) <u>730...770 min<sup>-1</sup></u>	E 9

**A7**

Rapid diagnostic chart

Volvo 240


**A8**

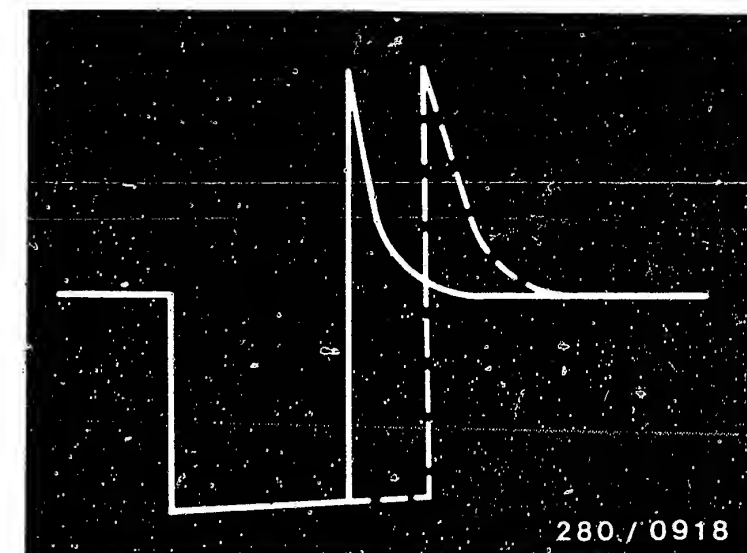
Rapid diagnostic chart

Volvo 240



# Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		But-ton	Measurement	Note	Test speci-fications (Reading)	For trouble-shooting, see Coordinates
	V	Ω					
23	11	24	3	Record on/off ratio at the idle actuator	Measurement with dwell angle tester at sockets 1 and 2 (1) Button 3 pressed. (2) Button 3 not pressed. (3) Step down on accelerator but speed under 2000 min <sup>-1</sup> (4) Also switch air conditioner on (if there is one) (5) Step on accelerator, speed above 3000 min <sup>-1</sup> . On/off ratio must increase	(1) 22 ... 26 % (2) 25 ... 29 % (3) 30 ... 34 % (4) 33 ... 37 % (5) Greater than 37 %	E 11
24	12	24	-	Control unit - functional test (engine at normal operating temperature). Check fuel-injection signal t <sub>i</sub> from the control unit with the oscilloscope. On control unit plug between Term. 13 and Term. 11.	Connect adapter lead to periphery and control unit. Run engine at normal operating temperature.		E 13  See Fig. at top <sup>1</sup>
25	12	24	1	Like 24, but after the button is pressed (NTC II cold) the duration of injection becomes somewhat longer.	Connect adapter lead to periphery and control unit. Run engine at normal operating temperature.		E 15
26	12	24	2	Like 24, but after the button is pressed (NTC II warm) the duration must remain constant.	Connect adapter lead to periphery and control unit. Run engine at normal operating temperature		E 17



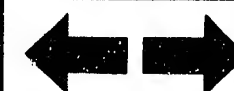
**A9**

Rapid diagnostic chart  
Volvo 240



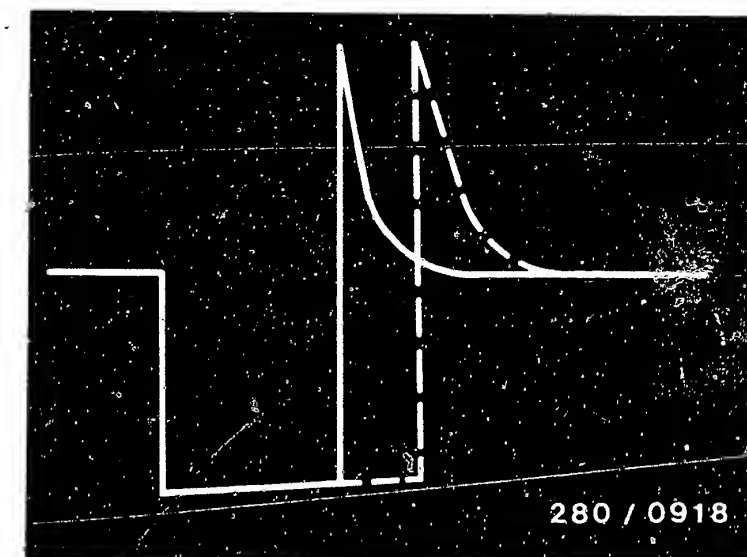
**A10**

Rapid diagnostic chart  
Volvo 240



# Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		Button	Measurement	Note	Test specifications (Reading)	For troubleshooting, see Coordinates
	V	$\Omega$					
27	12	24	5	Control unit - functional test, overrun cutoff. On the control unit plug between Term. 13 and Term. 11.	Connect adapter lead to control unit and periphery. Run engine at normal operating temperature. Hold speed constant at $2000 \text{ min}^{-1}$ . Press button 5. Fuel-injection signals disappear and return again at approx. $1300 \text{ min}^{-1}$ .	Briefly, no fuel-injection signals	E 19
28	12	24	6	Control unit - functional test, full-load enrichment. On the control unit plug between Term. 13 and Term. 11.	Connect adapter lead to control unit and periphery. Run engine at idle at normal operating temperature. Fuel-injection signal must become broader or the engine speed must increase when button 6 is pressed.	See Fig. at top	E 21
29	13	24	-	Hot-wire air-mass sensor. Measurement of voltage for the self-cleaning function. On the control unit plug between Term. 8 & Term. 11.	Connect adapter lead to control unit and periphery. Before this test, the engine must run at more than $2000 \text{ min}^{-1}$ and the engine temperature must be greater than $60^\circ\text{C}$ . After that ignition "OFF" - reading of voltage taken after approx. 4 sec.	2 ... 5 V (Duration of reading approx. 1 sec.)	E 23



Broader fuel-injection signal after button 6 is pressed.

**A11**

Rapid diagnostic chart  
Volvo 240



**A12**

Rapid diagnostic chart  
Volvo 240



## TEST SPECIFICATIONS

### Pressure regulator

- Fuel pressure: 2.3 ... 2.7 bar

### Electric fuel pump

- Fuel delivery  
(measured in the return): min. 700 cm<sup>3</sup>/30 sec.
- Connection voltage  
(under load): min. 12 V

### Temperature sensor II (engine)

- Internal electrical resistance at  
Ambient temperature  
(+15°C...+30°C): 1300 ... 3600 Ω  
Engine at normal operating temperature  
(approx. +80°C): 250 ... 390 Ω

### Solenoid-operated injection valve (at 20°C)

- Internal electrical resistance: 15.0 ... 17.5 Ω



### Hot-wire air-mass sensor

- Internal electrical resistance
  - between Term. 12 and Term. 6: 0 ... 1100  $\Omega$
  - between Term. 7 and Term. 6: 3.6 ... 4.1  $\Omega$

### Idle actuator

- Internal electrical resistance
  - at (+15°C ... +30°C)
    - between Term. 4 and Term. 5: 17 ... 22.5  $\Omega$
    - between Term. 4 and Term. 3: 19 ... 25.0  $\Omega$

### Idle adjustment

(Engine at normal operating temperature,  
approx. +80°C)

Manual and automatic transmissions: 730 ... 770 min<sup>-1</sup>

### Adjustment of integrator voltage

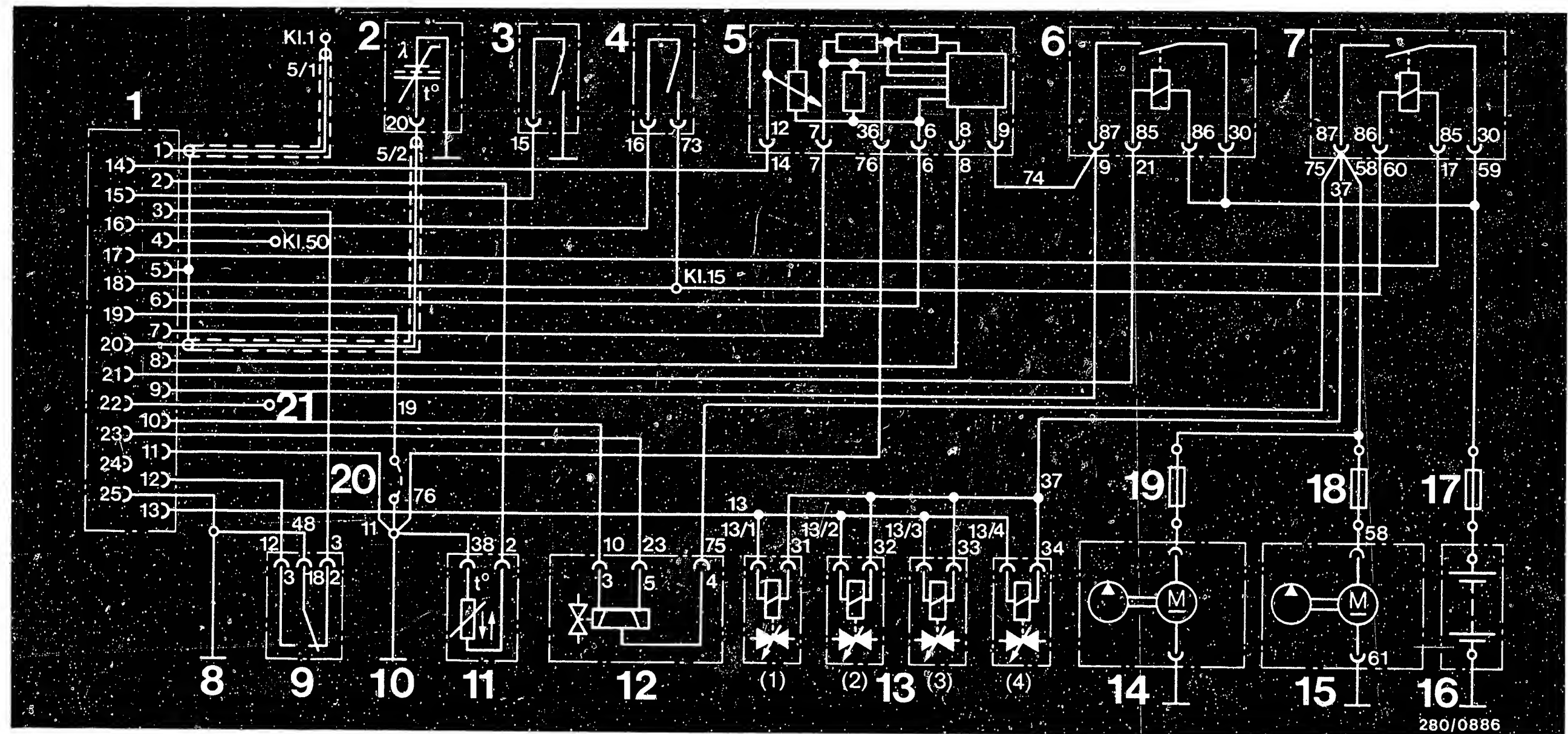
(Lambda closed-loop control)

- Closed-loop control operation (sensor connected):  
Reading for voltage fluctuates between 2 values.
- Open-loop control operation (sensor lead taken apart):  
Voltage reading must be equal to the average between the fluctuating values.
- Rich value (separate sensor lead and ground on control unit end): approx. 3.0 V
- Lean value (apply 2 V to the control unit end of the sensor lead): less than approx. 0.5 V

The sensor must be hot or there is only open-loop control operation.

For settings for ignition, valve clearance, and other engine data, see Equipment and Autodata Microfiche.





- 1 = Control unit plug
- 2 = Lambda sensor
- 3 = Idle controller (test pin)
- 4 = Air conditioner (switch)
- 5 = Hot-wire air-mass sensor
- 6 = Main relay
- 7 = Pump relay

- 8 = Ground terminal, output stage
- 9 = Throttle valve switch
- 10 = Ground terminal, electronic system
- 11 = Temperature sensor II
- 12 = Idle actuator
- 13 = Solenoid-operated injection valve
- 14 = In-tank pump

- 15 = Electric fuel pump
- 16 = Battery
- 17 = Blade-type fuse
- 18 = Pump fuse (electric fuel pump)
- 19 = Pump fuse (in-tank pump)
- 20 = Bridge for data coding
- 21 = Integrator output

ELECTRICAL CONNECTION DIAGRAM

**A15**

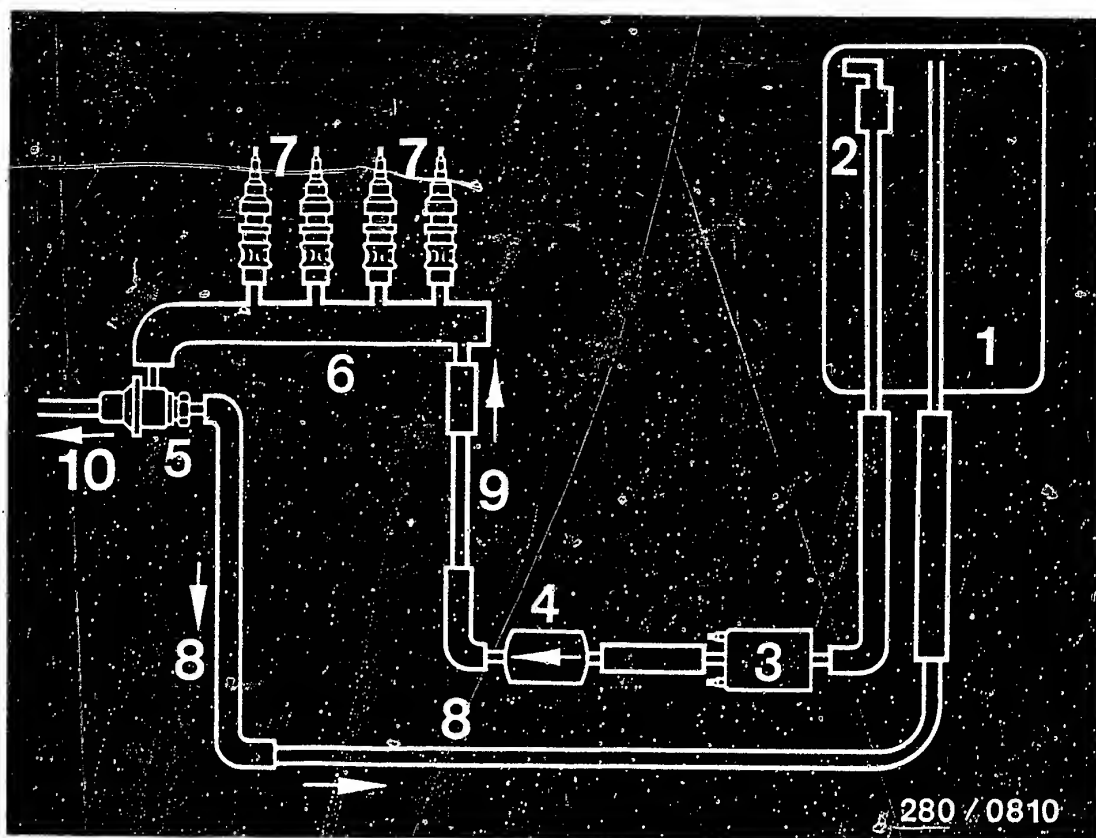
Electrical connection diagram  
Volvo 240



**A16**

Electrical connection diagram  
Volvo 240



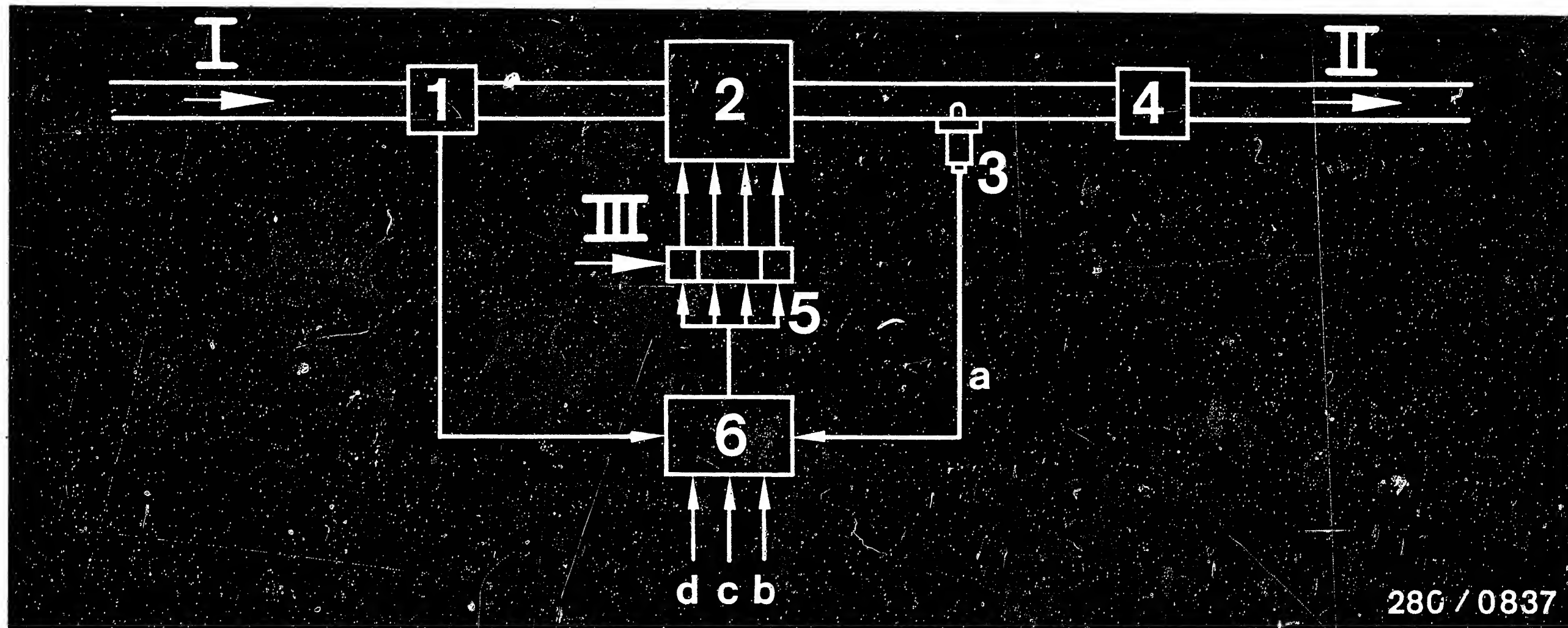


- 1 = Fuel tank
- 2 = Fuel pre-supply pump (in the tank)
- 3 = Electric fuel pump
- 4 = Fuel filter
- 5 = Pressure regulator
- 6 = Fuel distribution pipe
- 7 = Solenoid-operated injection valves
- 8 = Fuel return line
- 9 = Fuel delivery line
- 10 = To the intake manifold

#### FUEL LINE DIAGRAM

The fuel supply and return lines run along on the left on the bottom of the vehicle.





280 / 0837

1 = Air-flow sensor  
2 = Engine  
3 = Lambda sensor  
4 = 3-way catalytic converter

5 = Solenoid-operated injection valves  
6 = LH-control unit with lambda closed-loop control

a = Sensor voltage  
b = Supply voltage  
c = Engine speed  
d = Engine temperature

I = Air  
II = Exhaust gas  
III = Fuel

#### OPERATION OF THE LAMBDA CLOSED-LOOP CONTROL

Using the closed-loop control circuit which is closed using a special sensor - the lambda sensor - deviations from a given air/fuel ratio can be identified and corrected. The control principle is based on measurement of the remaining oxygen level in the exhaust gas continually with the lambda sensor. This oxygen level is an indicator for the composition of the air/fuel mixture being supplied to the engine. As a sensor in the exhaust pipe, the lambda sensor provides information as to whether the mixture is richer or leaner than  $\lambda = 1$ . The lambda sensor reports this deviation to the control unit, and the lambda closed-loop control (in the control unit) acts upon the fuel-injection duration as precalculated by the injection control or on the amount of fuel injected. This control to  $\lambda = 1$  is a prerequisite that enables the subsequent 3-way catalytic converter to burn the toxic substances efficiently.

**A18**

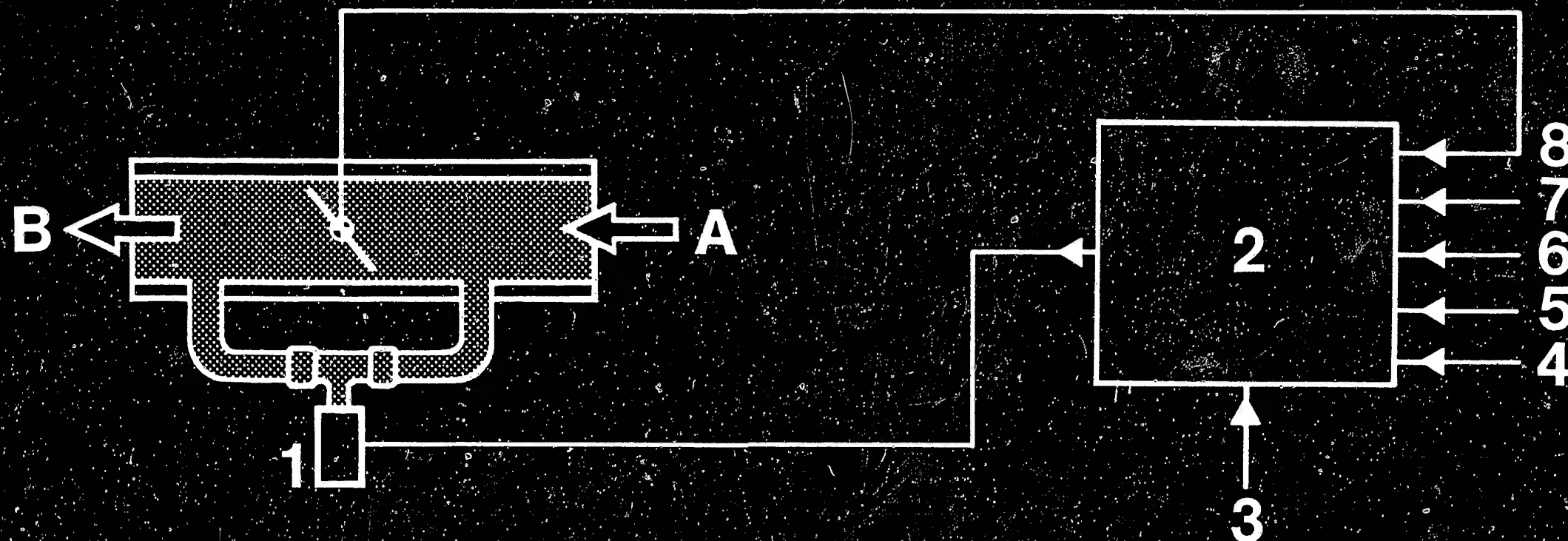
Lambda closed-loop control  
Volvo 240



**A19**

Lambda closed-loop control  
Volvo 240





280 / 0888

- |                                       |                        |                                           |                         |
|---------------------------------------|------------------------|-------------------------------------------|-------------------------|
| 1 = Idle actuator                     | 4 = Supply voltage     | 7 = Engine speed                          | A = From the air filter |
| 2 = Idle controller (LH-control unit) | 5 = Set value switch   | 8 = Idle contact of throttle valve switch | B = To the engine       |
| 3 = Test pin                          | 6 = Engine temperature |                                           |                         |

#### Operation of the idle speed control (LFR)

Using the LFR, it is possible to attain a constant engine idle behavior under all conditions that is favorable with regard to emissions and fuel consumption. Dips in engine speed are avoided when, for example, the air conditioner, power steering, or, with automatic transmissions, the drive are switched on. The wiring for this installation is accommodated in the LH-control unit. The idle actuator is in place of the auxiliary-air device otherwise needed.

#### Advantages

- Constant idle speed under all operating conditions.
- Reduced fuel consumption due to reduction in idle speed.
- No readjustment of idle speed required.
- Secondary air valves for power steering or air conditioner not required.
- Speed increase (switching on air conditioner) is possible.

- Testing: The electrical test and functional test are done with the universal test adapter. Testing of the idle speed control is included in the test sequence for the LH version. An adapter lead is used for testing the LH version and the idle speed control. Run the pneumatic test of the idle actuator the same way as for the auxiliary-air device.

**A20**

Idle speed control  
Volvo 240



**A21**

Idle speed control  
Volvo 240



## TEST EQUIPMENT AND TOOLS

Name	Designation	Part No.
Universal test adapter	ETT 018.01	0 684 101 801
Adapter lead		1 684 463 141
Pocket Tester	KTE 001.03	0 684 400 103
Motor tester	e.g. MOT 002.00	0 684 000 200
	MOT 300	0 684 000 300
	MOT 400	0 684 000 400
Test lead		1 684 463 093
Exhaust analyzer	e.g. ETT 008.00	0 684 100 800
Calibrated infrared	ETT 008.04	0 684 100 804
exhaust analyzer	or ETT 008.05	0 684 100 805
Lambda closed-loop control tester	KDJE-P-600	
Connecting lead	KDJE-P 600/51	
Lead	KDJE-P 600/1	
Pressure tester		KDJE-P 100
or		
Pressure tester (no longer available)		KDEP 1034
Connector	KDJE-P 100/14	
Set of parts for solenoid-operated injection valves		1 287 010 704
Solenoid-operated injection-valve		0 280 150 209
Set of parts for re- placeable non-return valve for electric fuel pump 0 580 464 022		1 587 010 007

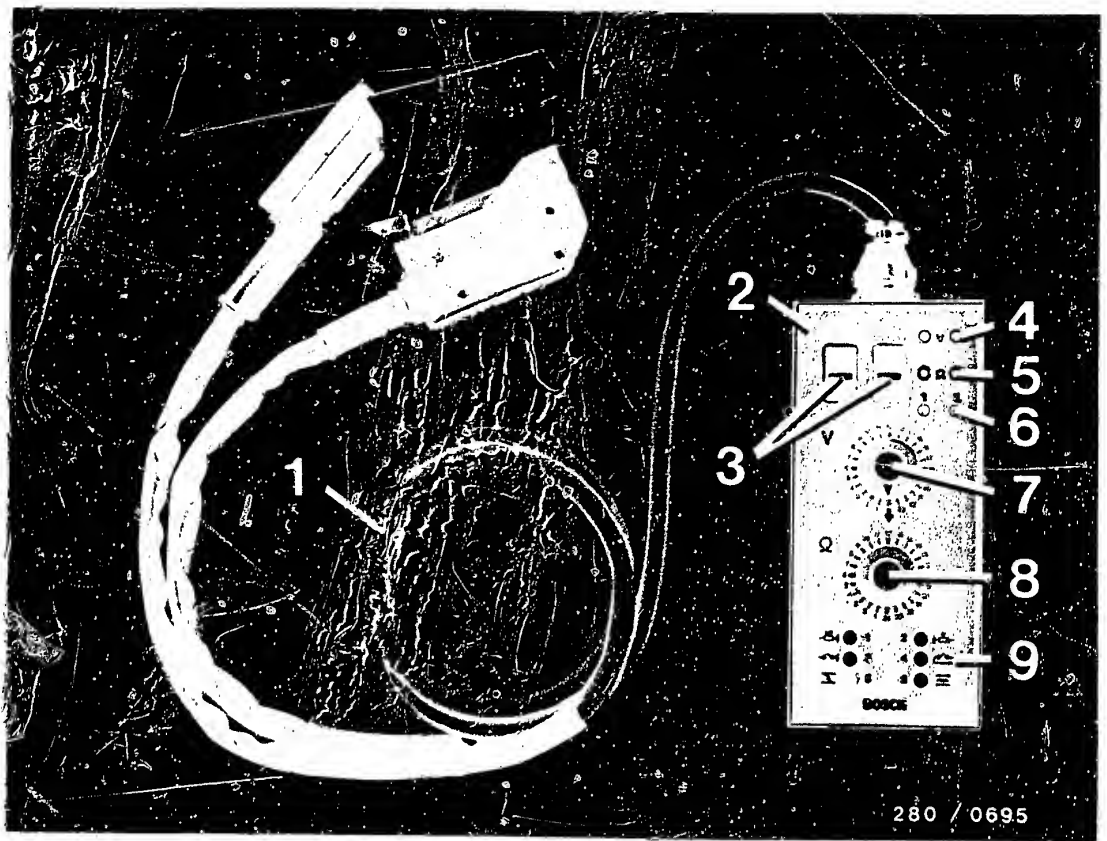


## Test equipment and tools (continued)

Name	Designation	Part No.
Electric tester or Multimeter	e.g. ETE 014.00 e.g. MDD 301  e.g. Philips PM 2517 X e.g. Mislco Master 50 K e.g. Chinaglia Cortina	0 684 101 400 0 684 500 301
Special grease for male thread on lambda sensor (tightening torque for lambda sensor 50 ... 60 Nm)		5 964 080 112

Use suitable commercially-available tools for removing and putting on the idle CO-anti-tamper device on the air-mass sensor.

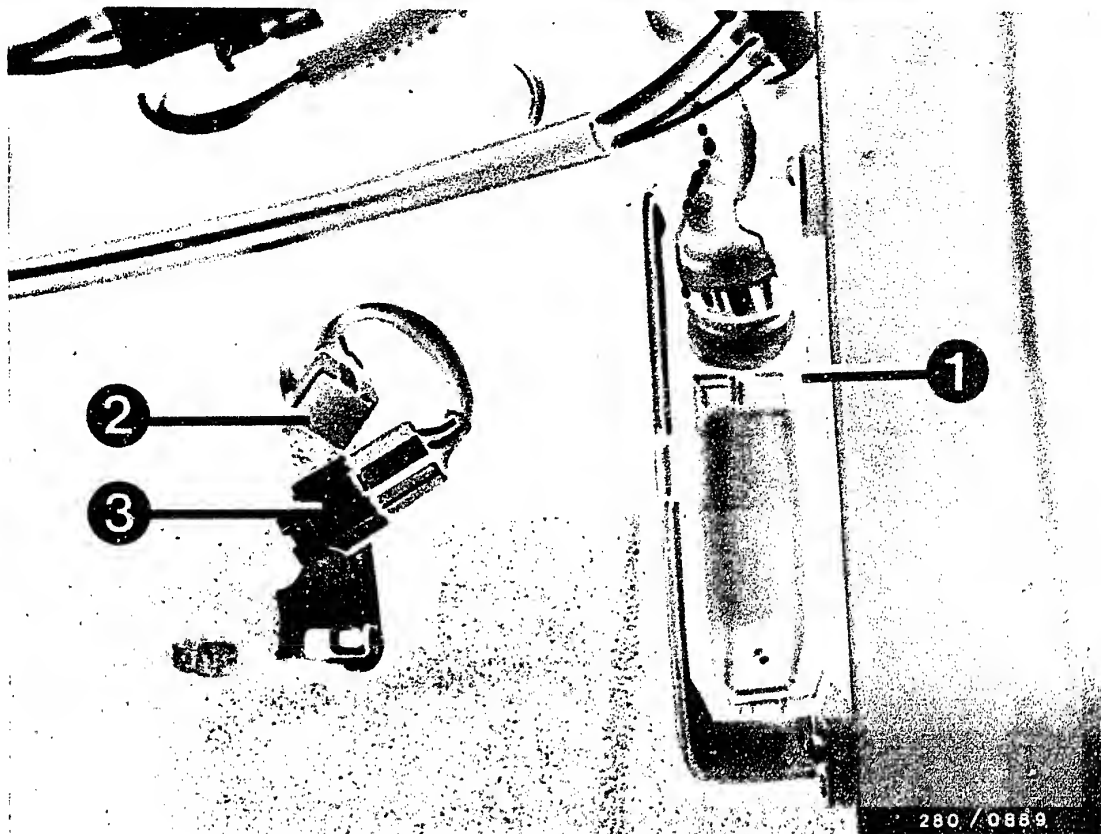




- 1 = Adapter lead (Part No.: 1 684 463 141)
- 2 = Universal test adapter (Part No.: 0 684 101 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for measurements of voltage)
- 5 = Test sockets (for measurements of resistance)
- 6 = Test sockets (for dwell angle tester)
- 7 = "Volt" program switch
- 8 = "Ohm" program switch
- 9 = Buttons
  - Buttons 1 and 2: Temperature sensors, cold and warm
  - Buttons 3 and 4: Button for ground or voltage supply
  - Buttons 5 and 6: Simulation of idle or full load

● Universal test adapter with adapter lead for L-Jetronic (version LH)





- 1 = LH-control unit (on the right in the front passenger's footwell, behind a panel)
- 2 = Pump relay
- 3 = Main relay

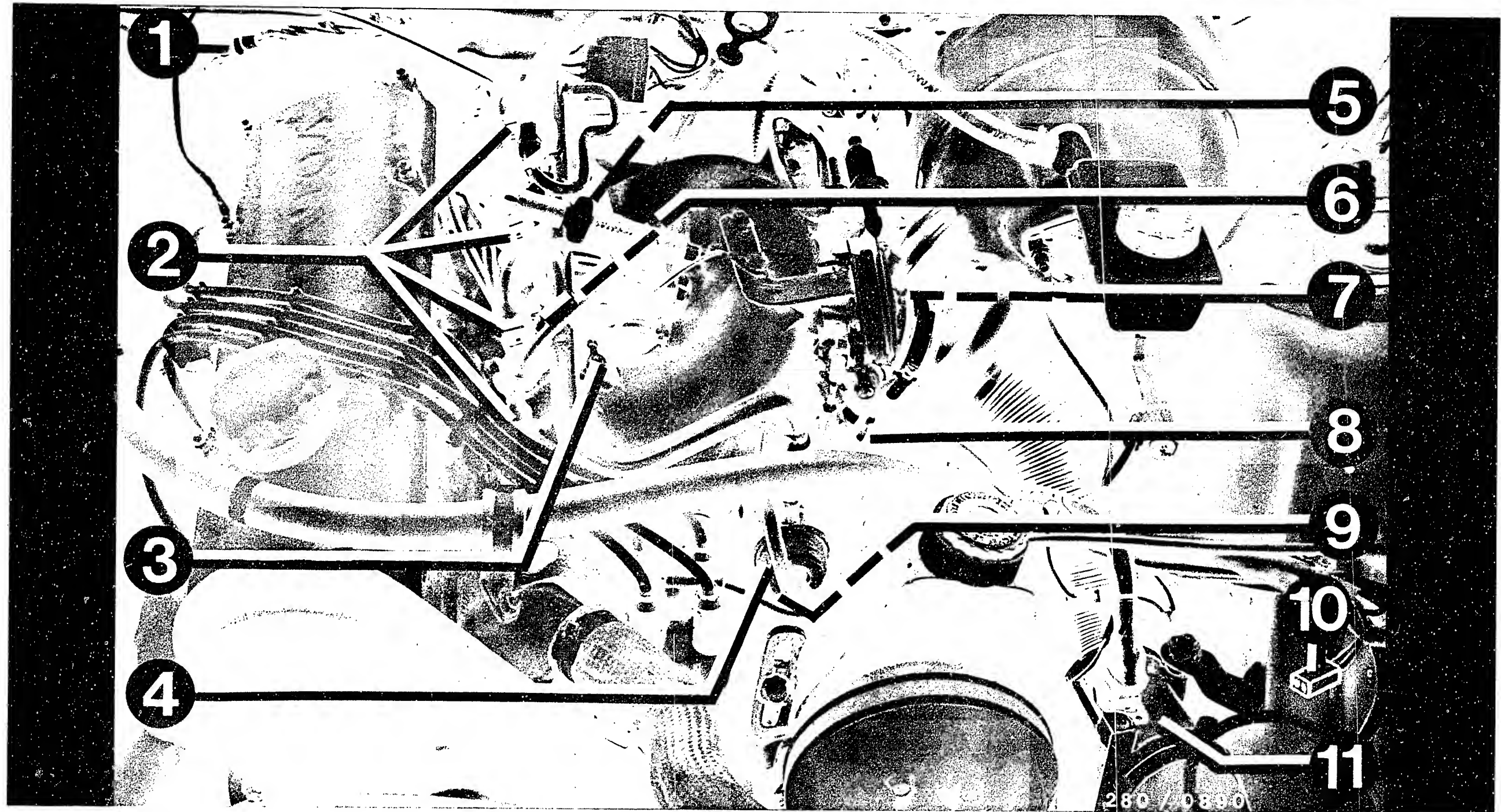
INSTALLATION POSITION OF THE COMPONENTS

**B1**

Installation position of the components  
Volvo 240







- 1 = Connection in sensor lead
- 2 = Solenoid-operated injection valves
- 3 = Ground terminal, electronic system
- 4 = Pressure regulator

- 5 = Ground terminal, output stage
- 6 = Temperature sensor (engine temperature)
- 7 = Throttle valve switch
- 8 = Setting screw for basic engine speed

- 9 = Idle actuator
- 10 = Test connection for integrator voltage and test pin for idle speed control
- 11 = Hot-wire air-mass sensor

Installation position of the components (continued)

**B2**

Installation position of the components  
Volvo 240



**B3**

Installation position of the components  
Volvo 240





## Installation position of the components (continued)

Electric fuel pump and  
fuel filter:

Under the vehicle, in  
front of the rear axle on  
the left

Pre-supply pump:

In the fuel tank

Pump fuse

In the central fuse box



### Important general instructions:

- Never start the engine unless the battery is firmly connected.
- A starting assist with more than 16 V or with a quick-charger is not allowed!
- Never separate the battery from the vehicle electrical system while the engine is running.
- When quick-charging the battery, disconnect it from the vehicle electrical system.
- Take the control unit out at temperatures above 80°C (paint-drying ovens).
- Make certain all connecting plugs on the wiring harness are properly seated.
- Never plug in or unplug the control unit plug while the ignition is switched on.
- When testing compression pressure, interrupt the power supply by disconnecting the main relay. That interrupts the supply of electricity for the L-Jetronic (LH version) and for the injection valves as well. In this way, undesired fuel injection is prevented. In addition, disconnect the connecting plug on the ignition trigger box.
- The LH control unit must be taken out for electrical welding (e.g., spot welding).
- When installing an alarm system, follow the instructions on microfiche card SIS-A11-500
- When applying the trouble-shooting that follows, it is a prerequisite that the engine be OK and the ignition be correctly set. The electrical system must be checked and if need be repaired.
- In order to be able to do the testing described in these instructions and to evaluate the components, you should know the L-Jetronic and how it works. The main points of this operation and the design of the L-Jetronic have been described in Technical Instruction VDT-U 3/3. The LH version has been described in the Technical Bulletin, New Product VDT-I-280/4 dated 10.83 and .: 280/7, dated 12.83.



## TROUBLE SHOOTING CHARTS

The trouble-shooting charts that follow are designed to make it possible, when using the universal test adapter and adapter lead (1 684 463 141) and other suitable testing equipment for workshop employees to identify quickly the causes of defects on the LH-version. Depending on the training and experience of the mechanic, one of the following job procedures can be selected:

- Detailed, step-by-step trouble-shooting chart

For employees with less experience and practice on vehicles with the LH-version.

Entry according to the customer complaint leads in each instance into a complete trouble-shooting program.

**C3**

- Targeted trouble-shooting chart leading directly to the cause of the defect

For trained and experienced employees with greater practice on vehicles with the LH-version.

Entry according to the customer complaint leads at one's option to a given component within the trouble-shooting program.

**C5**

Both trouble-shooting charts start with checking the electrical/electronic portion of the LH-version using the universal test adapter and the adapter lead.

With this, the electrical operation of the wiring harness and the components connected to it are checked in a short time, and defects are identified.

If no defects are found using the universal test adapter, it is necessary to run the fuel pressure test.

If no defects are found here, either, it is necessary to continue with the detailed or the targeted trouble-shooting chart.

**C1**

Trouble-shooting charts  
Volvo 240



**C2**

Trouble-shooting charts  
Volvo 240



# Detailed, step-by-step trouble-shooting chart for the complete trouble-shooting program

● Electrical test with the universal test adapter, adapter lead 1 684 463 141, and a motortester or multimeter  
Be absolutely certain to place this test at the start of the testing program and to run it from start through to end  
 (Coordinates C9 ... E24).

● Fuel pressure test with pressure gauge

It is absolutely necessary that this test follow the test with the universal test adapter and be run from start through to end  
 (Coordinates F1 ... F10).

● Trouble-shooting according to customer complaints (defect symptoms)

The table below lists possible defect symptoms, and, in the column to the right, the initial coordinates for the detailed trouble-shooting program pertinent to them.

This program consists of test steps in a proper sequence for all individual components of the LH-version. If the defect has not been identified and corrected after concluding the trouble-shooting program for one assumed symptom, a different program must be determined using a new defect symptom, and that program must be worked through.

<u>Customer complaints (defect symptoms)</u>	<u>Electrical test with universal test adapter</u>	<u>Fuel pressure test with pressure gauge</u>	<u>Trouble-shooting program</u>
1. Starting motor turns, engine does not start or starts only with difficulty	C 9	F 1	F 11
2. Engine starts but then dies	C 9	F 1	G 1
3. Rough idle or incorrect idle speed	C 9	F 1	G 13
4. Poor throttle take-up	C 9	F 1	H 11
5. Engine missing in all driving conditions	C 9	F 1	J 1
6. Poor mileage	C 9	F 1	J 23
7. Insufficient max. power or max. velocity	C 9	F 1	K 15
8. Idle speed and CO-adjustment too low or too high	C 9	F 1	L 3
Checking the lambda closed-loop control	C 9	F 1	H 1

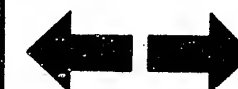
**C3**

Trouble-shooting  
Volvo 240



**C4**

Trouble-shooting  
Volvo 240



Targeted trouble-shooting chart leading directly to the cause of the defect, for components within the trouble-shooting programs

● Electrical test with the universal test adapter, adapter lead (1 684 463 141) and a motortester or multimeter

It is absolutely necessary to place the test with the universal test adapter at the start of the program and to run it from start through to end (Coordinates C9 ... E24).

● Fuel pressure test with pressure gauge

It is absolutely necessary that the fuel pressure test follow the test with the universal test adapter and that it be run from start through to end (Coordinates F1 ... F10).

● Trouble-shooting according to customer complaint

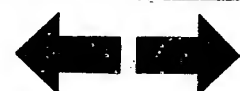
The table below lists various defect symptoms and several possible causes of the defect in each instance. The reference blocks indicate the initial coordinates for the test step on the individual components involved in the LH-version. If the defect has not been identified or corrected after conclusion of the testing on the individual components, a new defect symptom must be determined.

Customer complaint (defect symptoms)

1. Starting motor turns, engine does not start or starts only with difficulty								
2. Engine starts and then dies								
3. Rough idle or incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing in all driving conditions								
6. Poor mileage								
7. Insufficient max. power or max. velocity								
8. Idle speed and CO-adjustment too low or too high								
<u>Cause</u> (component defect)								
B 9	B 9	B 9	B 9	B 9	B 9	B 9	B 9	Defects in the electrical system. Test with universal test adapter
F 1	F 1	F 1	F 1	F 1	F 1	F 1	F 1	Defects in the fuel supply system: (Main and pump relay, pump fuse, pre-supply pump, electric fuel pump. Check fuel pressure and pressure regulator. Fuel pressure does not remain constant.)
F19	G 3	G17	H15					Idle actuator mechanically defective
F21	G 9		H17	J 5	K 5	K23	L17	Hot-wire air-mass sensor
				J 9				Engine coughing

**C5**

Trouble-shooting  
Volvo 240



**C6**

Trouble-shooting  
Volvo 240



# Customer complaints (defect symptoms)

1. Starting motor turns, engine does not start or starts only with difficulty
2. Engine starts and then dies
3. Rough idle or incorrect idle speed
4. Poor throttle take-up
5. Engine missing in all driving conditions
6. Poor mileage
7. Insufficient max. power or max. velocity
8. Idle speed and CO-adjustment too low or too high
- Cause (component defect)

F13							L 7	Start-control defective
F23	G11	G23	H19	J21	K13	L 1	L19	Leaks in intake system
		G19		J15	K 7			Solenoid-operated injection valves defective. Connect test lead, repair
	G 5				K 1		L13	Solenoid-operated injection valves leaking
				J 7		K19		Fuel delivery from electric fuel pump too low
						K21		Time interval for replacement of exhaust catalytic converter, lambda sensor
		G15	H13	J11				Throttle valve is not closing. Throttle valve switch (adjustment)
						K17		Throttle valve is not opening all the way
				J13				Overrun cutoff
				J 3				Breaks in wiring harness and plug connections, interference, missing ground contact
				J 9				Control unit defective
		H 1						Lambda closed-loop control defective, idle adjustment, adjustment of integrator voltage

C7

Trouble-shooting  
Volvo 240



C8

Trouble-shooting  
Volvo 240



# TEST CHART FOR THE UNIVERSAL TEST ADAPTER

With adapter lead 1 684 463 141 connected, LH-version in the Volvo 240 vehicles  
with engine B 23 F starting from model year 83

- Before testing with the universal test adapter, check all multiple plug connections for loose contacts.  
Clean dirty or corroded plug contacts.
- Watch out for receptacles that have been shoved back. If need be, rebend the prong, and press the receptacle in down to the stop in the plug housing. The prong catches.
- Suspect breaks in leads or they are pinched or kinked.

Installation location of the control unit: In the front passenger's footwell, at the lower right, on the A-pillar.

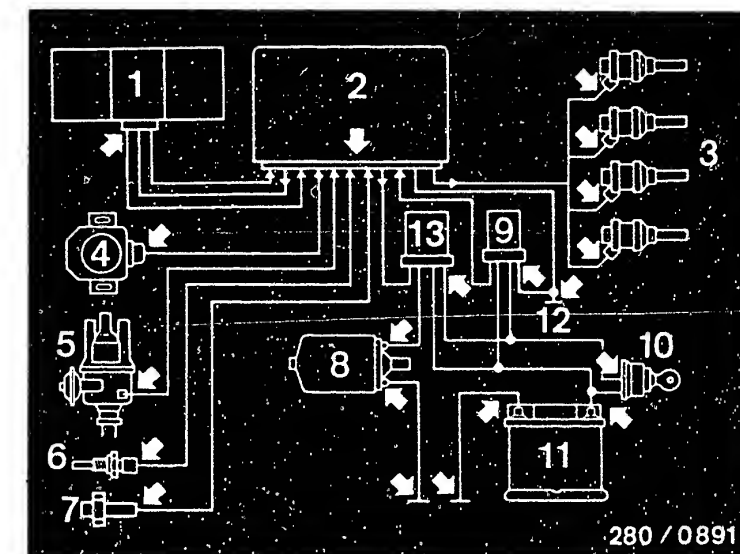
Using the universal test adapter, the periphery of the electrical system is checked, and the LH-control unit is also checked by means of a functional test. Disconnect control unit plug of the Jetronic wiring harness from the control unit and connect to the plug on the adapter lead. Connect the free end of the adapter lead to the control unit. (The ignition must be switched off.) Connect a motortester to the universal test adapter for taking measurements, or a multimeter for measuring voltages and resistances. Caution! Because the connection of the adapter lead must always be changed for testing the periphery and the functional test, follow the instructions in the test chart. The individual test steps are selected by using two program switches (one for measuring voltages, the other for measuring resistances). Each program switch has 24 test settings, but only some of them have been assigned for the LH-version. If a defect is found during a test, that test must be repeated after correcting the defect.

Testing with the universal test adapter must always be carried out in its entirety.

Be absolutely certain to follow the instructions in the test chart!

- In test steps 1 ... 9, resistances are measured. Set the motortester or the multimeter to "scale for resistances".
- In test steps 10 ... 15, voltages are being measured during start or with the ignition "ON".  
Set the motortester or multimeter to "scale for voltages".
- Test steps 16 ... 29 are tests with the engine running.

Test specifications and instructions for operation of the universal test adapter are given in the test chart that follows.



Electrical plug connections  
(arrows)

- 1 = Hot-wire air-mass sensor
- 2 = Control unit
- 3 = Solenoid-operated injection valves
- 4 = Throttle valve switch
- 5 = Ignition distributor
- 6 = Temperature sensor (engine)
- 7 = Idle actuator
- 8 = Electric fuel pump
- 9 = Main relay
- 10 = Ignition lock
- 11 = Battery
- 12 = Central ground
- 13 = Pump relay





### Connection:

The figure at the right shows the two test set-ups in connection with the universal test adapter. From top to bottom:

- Test set-up with a motortester (1)
- Test set-up of the universal test adapter (8) with the LH-adapter lead (13).
- Test set-up with a multimeter (14) and/or a dwell angle tester (15).

The broken lines indicate the test set-ups that are optionally possible.

- Connect the universal test adapter (8)
- Connect LH-adapter lead (13) to the universal test adapter.
- Disconnect the control unit plug (9) of the Jetronic wiring harness from the control unit and connect it to the wiring harness plug (10) of the adapter lead.
- Plug the control unit plug (11) of the adapter lead on the control unit (12).  
(Please follow instructions in the individual test steps.)

### Test set-up for testing with a motortester (1):

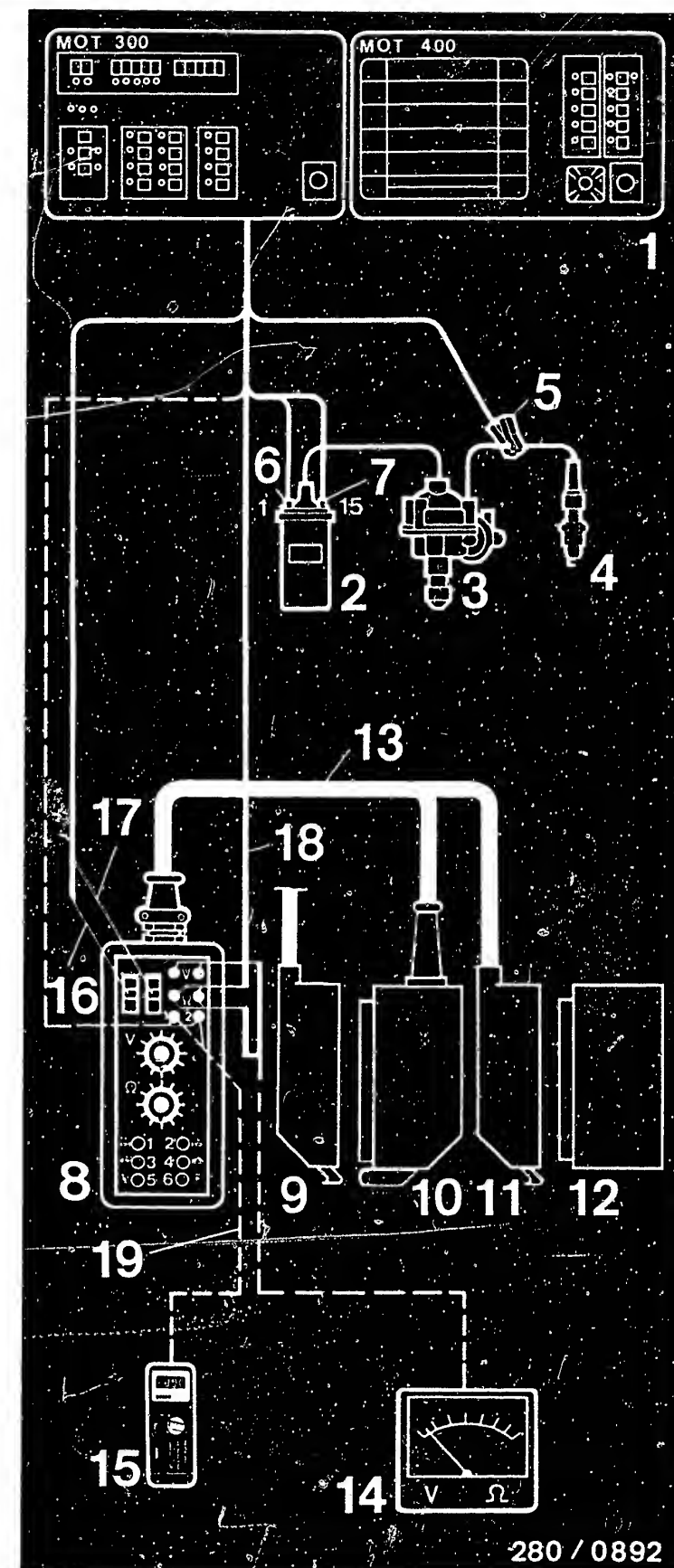
- Clamp-on induction pick-up (5) on the ignition lead of cylinder 1 (4) (close to the distributor) (3).
- Red terminal (16) in the red connection terminal.
- Black terminal (17) in the black connection terminal.
- Lead for measuring resistance (18) with red and black test prod at the blue sockets.
- Connect green (6) and yellow (7) clips to sockets 1 and 2 on the universal test adapter for measurement of dwell angle.

### Test set-up for testing with a multimeter (14) $R_i = \min. 20 \text{ k}\Omega/\text{V}$

- Measurement of resistance  
Multimeter (14) in setting  $\Omega$ , or plug measuring leads into the connections for measurement of resistance and plug the test leads on the universal test adapter into the blue test sockets.
- Measurement of voltage  
Multimeter (14) in setting V, or plug measuring lead into the connections for measurement of voltage and plug the test leads on the universal test adapter into the red and black test sockets. (Watch polarity.)
- Measurement of dwell angle  
Pocket-tester (15) at setting dwell angle 100%.  
Connect connecting lead (19) to sockets 1 and 2 on the universal test adapter.

### Caution!

Plug in and unplug the universal test adapter only while the ignition is switched off.



**C11**

Test chart for universal test adapter  
Volvo 240



**C12**

Test chart for universal test adapter  
Volvo 240



## Prerequisites for the correct sequence of testing

1. Start testing at test step 1.
2. The sequence for test steps must be maintained. The trouble-shooting indicated builds upon the previous trouble-shooting test steps.

### Example:

Once the ground connection Term. 11 for the control unit has been tested in test step 1, that test is no longer repeated in the test steps that follow.

3. If an incorrect reading is obtained in one of the test steps, that test step must be repeated once the defect has been corrected.

### Caution!


Test steps 1 - 15: Plug in only the control unit plug of the adapter lead!

Test steps 16 - 29: Connect the adapter lead to the control unit and periphery!

### Note:

A white border in the column "operation" for the test steps that follow indicates what operation is to be changed from that of the preceding test step.



TEST STEP 1 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
<u>Program switch "V" in setting</u>	 5	Tester must read 1300...3600 Ω at ambient temperature (+15°C...30°C) 250...390 Ω with engine at normal operating temperature (+80°C).	<u>Component:</u> Temperature sensor II (engine)
<u>Program switch "Ω" in setting:</u>			
<u>Test equipment:</u> Motortester or multimeter			<u>Operation:</u> Resistance from control unit plug Term. 10 to the ground terminal for the electronic system
<u>Scale:</u> x 10 Ω			
<u>Connection:</u> Blue test sockets		<div>yes</div> <div>Continue testing with <u>next test step.</u></div>	<u>Malfunction:</u> Resistance not within tolerance
<u>Operation in vehicle:</u> ---		<div>no</div>	

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Measure resistance directly on the engine temperature sensor, (white plug).

At ambient temperature (+15°C ... +30°C): 1300 ... 3600  $\Omega$

With engine at normal op. temp. (approx. +80°C): 250 ... 390  $\Omega$

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0  $\Omega$ ):

- From the control unit plug Term. 2 to the temperature sensor II (engine), Term. 2
- Lead 38 from temperature sensor II to the ground terminal for the electronic system.
- From the control unit plug Term. 11 to the ground terminal for the electronic system.

Eliminate contact resistances in the plug connections.

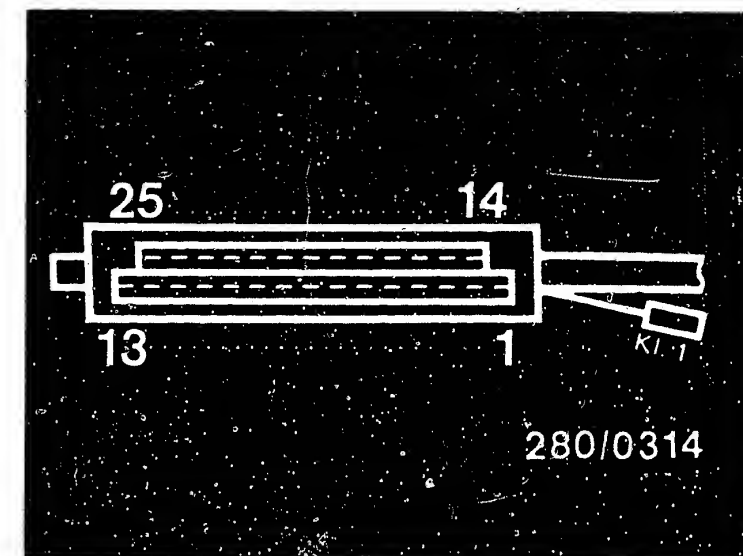
It must not be possible to shove the spring contacts back!

If the value measured for resistance is not within tolerance, take out and replace the temperature sensor.

#### Installation position of the components

Temperature sensor II: In the engine compartment, on the left of the engine block, near the engine bulkhead.

Ground terminal: Under the front fastening screw for the fuel distribution pipe, in the center of the engine compartment.



Top view of control unit plug

**C14**

Test chart for universal test adapter

Volvo 240




**C15**

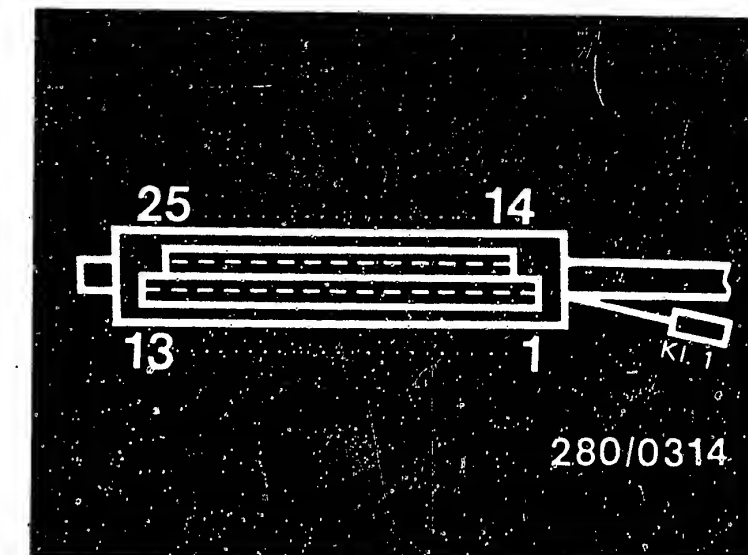
Test chart for universal test adapter

Volvo 240



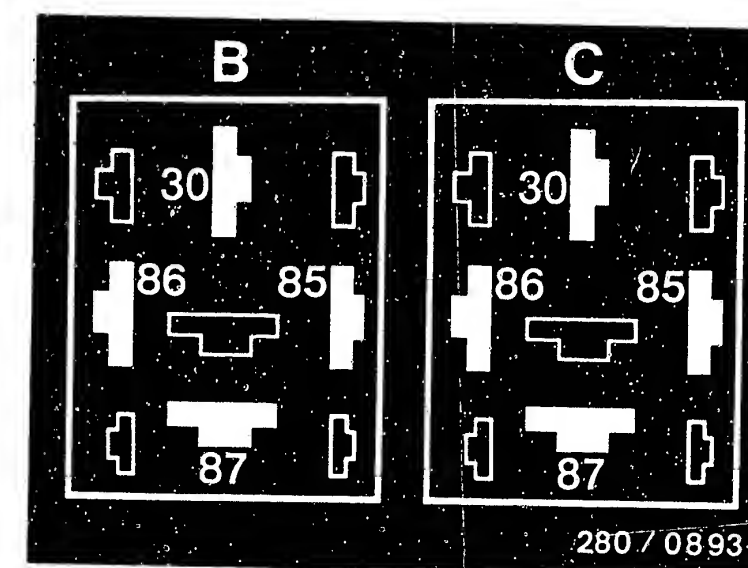


TEST STEP 3 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
<u>Program switch "V" in setting</u>		The tester must read 8.50...11.0 Ω at ambient temperature (+15°C...+30°C), 8.70...11.5 Ω with engine at normal operating temperature (+80°C).	<u>Component:</u> Solenoid-operated injection valves 1, 2, 3, and 4 (pump fuse, pre-supply and elec- tric fuel pumps)
<u>Program switch "Ω" in setting</u>	8		
<u>Test equipment:</u> Motortester or multimeter			
<u>Scale:</u>	x 1 Ω	<div>yes</div> <div>no</div>	<u>Operation:</u> Resistance at the control unit plug Term. 13 to ground
<u>Connection:</u> Blue test sockets			<u>Malfunction:</u> Resistance not within tolerance
<u>Operation in vehicle:</u> ----			
		<div>Continue testing with next test step.</div>	



Top view of control unit plug

Main relay (B) and pump relay (c) unplugged. Top view of plugs



#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx.  $0\ \Omega$ ):

- From multiple plug Term. 13 to the solenoid-operated injection valves.
- From the solenoid-operated injection valves to the pump relay Term. 87.
- From the pump relay Term. 87 via lead 58 to the pump fuse No. 5. for the pre-supply pump (in tank) and No. 7 for the electric fuel pump.
- From the pump fuses to the pumps (positive connection).
- Check the ground connections for the pre-supply pump and the electric fuel pump.

Measurement of resistance on the solenoid-operated injection valve:

At ambient temperature (+15°C...+30°C):

$15...17.5\ \Omega$

With engine at normal operating temperature (approx. +80°C):

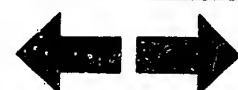
$17...20\ \Omega$

If reading is too high: There is a break in the valve coil, or a valve connector has dropped off. Check the seat for the plug blades. It must not be possible to shove the spring contacts back.

Continued on C20

**C18**

Test chart for universal test adapter  
Volvo 240



**C19**

Test chart for universal test adapter  
Volvo 240



## Test step 3, continued

### Installation position of the components

#### Solenoid-operated injection valves:

In the engine compartment at the center, on the fuel distribution pipe.

#### Pump relay:

In the passenger compartment, at the lower left in the front passenger's footwell, next to the LH-control unit.

#### Pump fuses:

In the central fuse box in the driver's footwell on the left, on the A-pillar  
No. 5 → pre-supply pump  
No. 7 → electric fuel pump

#### Electric fuel pump:

On the left in front of the rear axle under the vehicle.

#### Pre-supply pump:

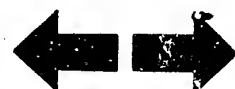
(In-tank pump): At the back left in the trunk compartment, under a cover.

#### Ground connection for the electric fuel pump:

On the left under the rear bench seat.

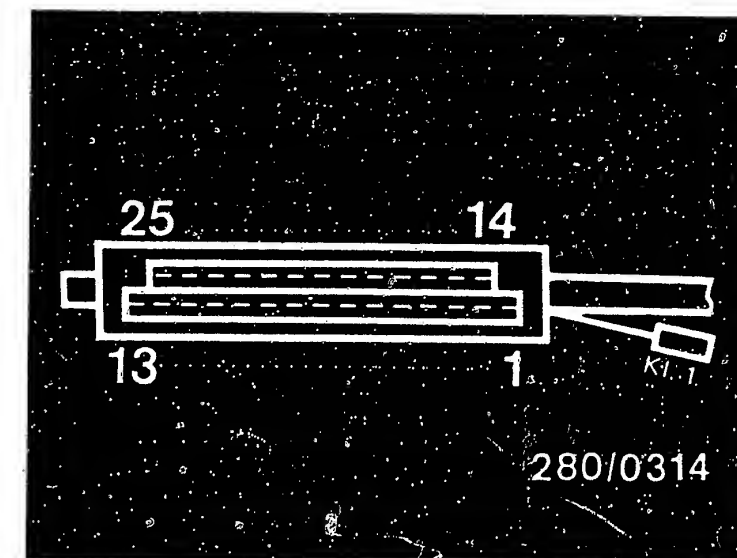
#### Ground connection for the pre-supply pump:

On the left in the trunk compartment. Brown lead, under a cover.





TEST STEP 4 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
Program switch "V" in setting	↓	Tester must read 0 ... 10 $\Omega$	Component: Throttle valve switch (idle contact)
Program switch "Ω" in setting	9		
Test equipment: Motortester or multimeter	<div>yes</div> <div>no</div>	<div>Continue testing with next test step.</div>	Operation: Resistance on the control unit plug Term. 3 to ground
Scale: x 1 $\Omega$			Malfunction: Resistance not within tolerance
Connection: Blue test sockets			
Operation in vehicle: Accelerator pedal in at rest position			



Top view of control unit plug

#### Trouble-shooting

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

#### Adjustment of the throttle valve switch:

Release the fastening screws for the throttle valve switch slightly. Connect an ohmmeter to the throttle valve switch between Term. 2 and Term. 18. Turn the throttle valve switch a bit to the right. Then to the left, until the idle contact closes. (The microswitch clicks audibly). Reading 0  $\Omega$ . Retighten the fastening screws. If the reading is not correct take out and replace the throttle valve switch.

Checking adjustment: Pull on the accelerator cable somewhat. The idle contact opens. (The microswitch clicks audibly.) Reading  $\infty \Omega$ .

Check the following leads for continuity using an ohmmeter

(Specified value approx. 0  $\Omega$ ):

- From the control unit plug Term. 3 to the throttle valve switch Term. 2.
- From throttle valve switch Term. 18 (Lead 48) to the ground terminal for the output stage.

It must not be possible to shove spring contacts back.

Eliminate contact resistances in the plug connections.

#### Installation position of the components:

##### Throttle valve switch:

In the engine compartment, on the throttle-valve assembly, on the left in the direction of the engine bulkhead.

##### Ground terminal:

Under the rear fastening screw for the fuel distribution pipe, in the center of the engine compartment.

**C21**

Test chart for universal test adapter  
Volvo 240



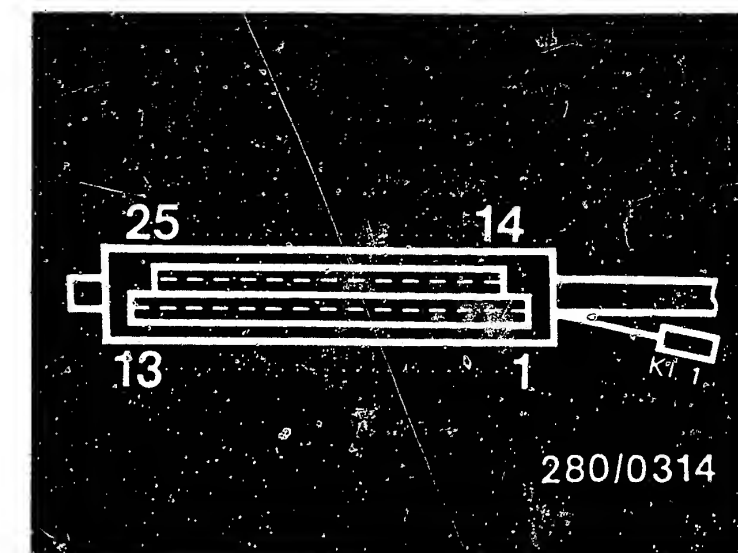
**C22**

Test chart for universal test adapter  
Volvo 240





TEST STEP 5 (Plug in only control unit plug of the adapter lead!)				
Operation		Reading		Testing of periphery
Program switch "V" in setting	↓	Tester must read 0 ... 10 Ω		Component: Throttle valve switch (full load contact)
Program switch "Ω" in setting	10			
Test equipment: Motortester or multimeter	<div> <div>Yes</div> <div>Continue testing with next test step</div> </div>		<div>No</div>	Operation: Resistance on the control unit plug Term. 12 to ground
Scale: x 1 Ω				Malfunction: Resistance not within tolerance
Connection: Blue test sockets				
Operation in vehicle: Accelerator pedal in full load setting (step all the way down on it)				



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect the control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω):

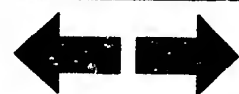
- From the control unit plug Term. 12 to the throttle valve switch Term. 3.

Eliminate contact resistances in the plug connections.

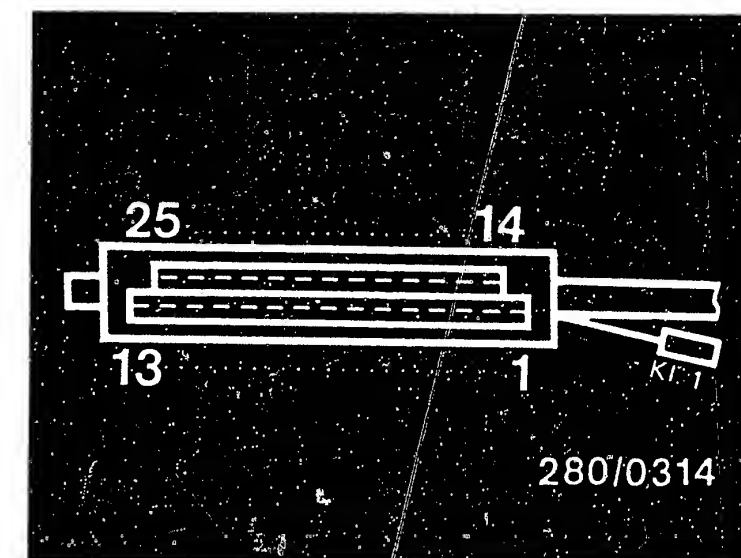
- It must not be possible to shove spring contacts back.

#### Installation position of the components

Throttle valve switch: In the engine compartment, on the throttle valve assembly, on the left in the direction of the engine bulkhead.



TEST STEP 6 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
Program switch "V" in setting	↓	The tester must read $20.0 \dots 32 \Omega$ at ambient temperature (+15°C...+30°C): $24.5 \dots 37.0 \Omega$ with engine at normal operating temperature (+80°C).	Component: Idle actuator (coil between Term. 3 and Term. 4)
Program switch "Ω" in setting	11		
Test equipment: Motortester or multimeter			Operation: Resistance on the control unit plug Term. 10 to ground
Scale: x 1 Ω		Yes ↓ No ↓	
Connection: Blue test sockets			Malfunction: Resistance not within tolerance
Operation in vehicle: -----		Continue testing with next test step	



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω):

- From the control unit plug Term. 10 to the idle actuator Term. 3.
- From the idle actuator Term. 4 to the pump relay Term. 87/2.
- Measurement of resistance on the idle actuator between Term. 3 and Term. 4.  
At ambient temperature (+15°C...+30°C):  $19.0 \dots 25.0 \Omega$

Eliminate contact resistances in the plug connections.  
It must not be possible to shove spring contacts back.

#### Installation position of the components

Idle actuator: At the center in the engine compartment, at front under the intake manifold.

Pump relay: On the left in the passenger compartment, under the LH-control unit.

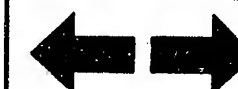
D1


Test chart for universal test adapter  
Volvo 240

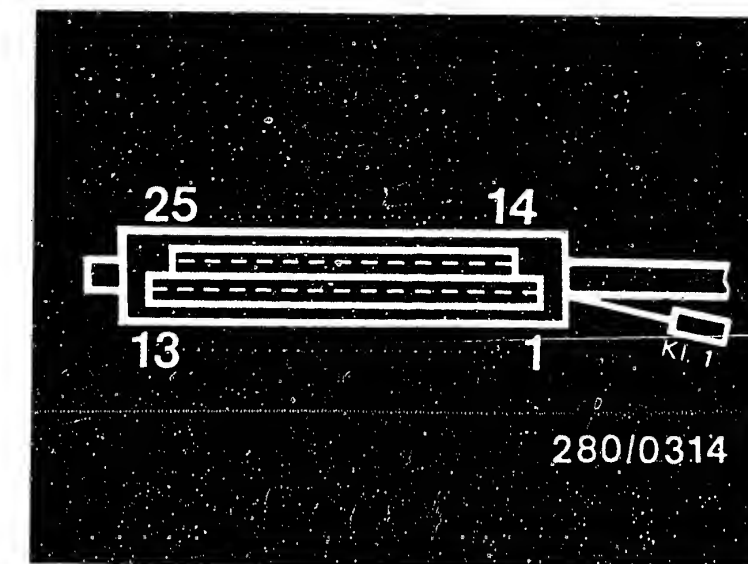


D2

Test chart for universal test adapter  
Volvo 240



TEST STEP 7 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
<u>Program switch "V" in setting</u>		The tester must read 18 ... 29.5 Ω at ambient temperature (+15°C...+30°C): 22 ... 34 Ω with engine at normal operating temperature (+80°C).	<u>Component:</u> Idle actuator (coil between Term. 5 and Term. 4).
<u>Program switch "Ω" in setting</u>			
<u>Test equipment:</u> Motortester or multimeter			
<u>Scale:</u> x 1 Ω			<u>Operation:</u> Resistance on the control unit plug Term. 23 to ground.
<u>Connection:</u> Blue test sockets			
<u>Operation in vehicle:</u> -----		<div>Yes ↓ Continue test- ing with <u>next</u> test step</div>	<div>Malfunction Resistance not within tolerance</div>
		<div>No ↓</div>	



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
 (Specified value approx. 0  $\Omega$ ):

- From the control unit plug Term. 23 to the idle actuator.
- Measurement of resistance on the idle actuator between Term. 5 and Term. 4:  
 At ambient temperature (+15°C...+30°C): 17...22.5  $\Omega$

Eliminate contact resistances in the plug connections.  
 It must not be possible to shove the spring contacts back.

#### Installation position of the components

Idle actuator: In the engine compartment at the center, at the front under the intake manifold.

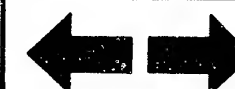
**D3**


Test chart for universal test adapter  
 Volvo 240

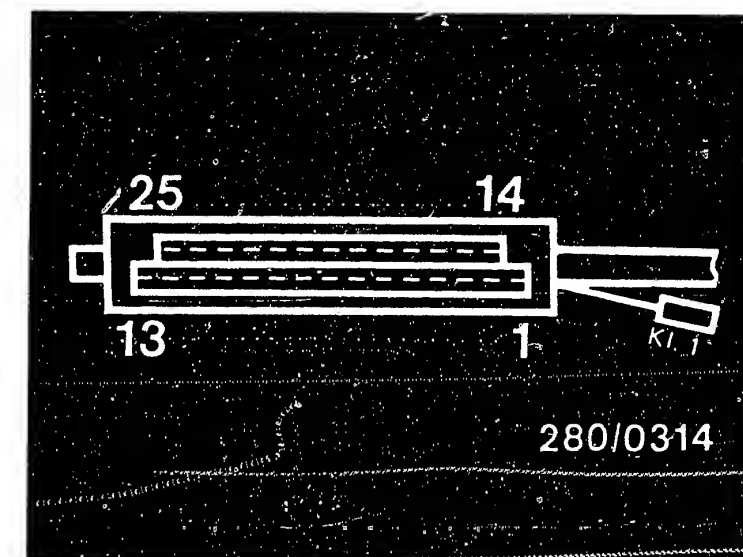


**D4**

Test chart for universal test adapter  
 Volvo 240

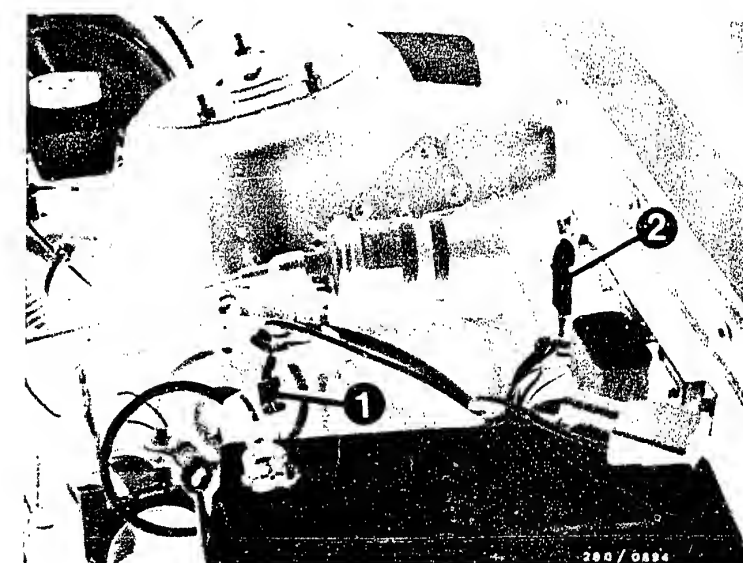


TEST STEP 8 (Plug in only control unit plug of the adapter lead!)				
Operation		Reading		Testing of periphery
<u>Program switch "V" in setting</u>		Tester must read <u>0 ... 10 Ω</u>		<u>Component:</u> Test pin for idle speed control
<u>Program switch "Ω" in setting</u>	13			
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>↓</div> <div>Continue testing with <u>next test step</u></div>	<div>No</div> <div>↓</div>	<u>Operation:</u> Resistance at control unit plug Term. 15
<u>Scale:</u> x 1 Ω				
<u>Connection:</u> Blue test sockets				
<u>Operation in vehicle:</u> Ground test pin (blue/white lead).				
				<u>Malfunction:</u> Resistance not within tolerance



Top view of control unit plug

1 = 2-pole plug connection blue/white lead → test pin



#### Trouble-shooting

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0  $\Omega$ ):

- Control unit plug Term. 15 to the 2-pole plug connection (blue/white lead).
- From the plug connection (blue/white lead) to ground.
- Good ground connection.

Eliminate contact resistances at the plug connections.  
It must not be possible to shove the spring contacts back.

#### Caution!

The ground connection for the test pin must be removed again after completion of this test step.

**D5**

Test chart for universal test adapter  
Volvo 240

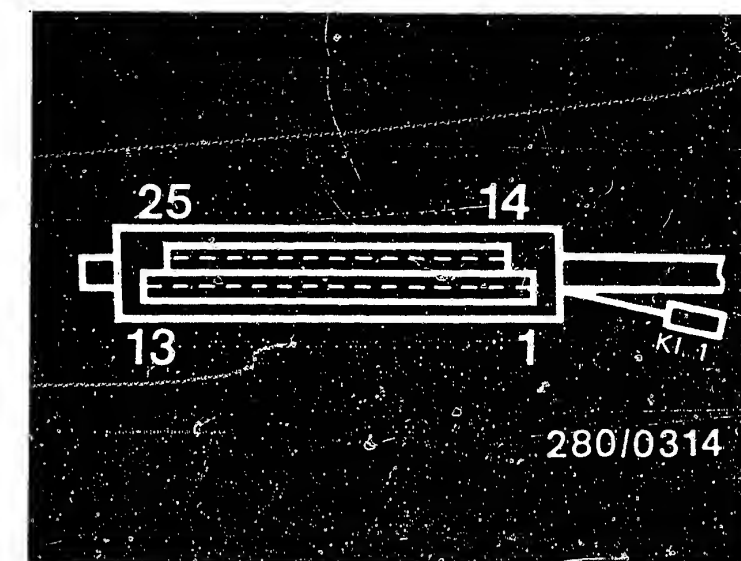


**D6**

Test chart for universal test adapter  
Volvo 240



TEST STEP 9 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
Program switch "V" in setting	↓	Tester must read 150 ... 600 Ω	Component: Potentiometer in the hot-wire air-mass sensor (HLM)
Program switch "Ω" in setting	21		
Test equipment: Motortester or multimeter	<div>Yes</div> <div>Continue testing with next test step</div> <div>No</div>		Operation: Potentiometer for idle-mixture adjustment, resistance at control unit plug Term. 14 and Term. 6
Scale: x 10 Ω			Malfunction: Resistance not within tolerance
Connection: Blue test sockets			
Operation in vehicle: -----			



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω):

- From the control unit plug Term. 14 to the hot-wire air-mass sensor Term. 12.
- From the hot-wire air-mass sensor Term. 6 to the control unit plug Term. 6.

Measure resistance directly on the hot-wire air-mass sensor between Term. 12 and Term. 6. Specified value 150...600 Ω.

Set resistance at 370...390 Ω. If not possible, take out and replace the hot-wire air-mass sensor. If possible, be absolutely certain to check the CO adjustment.

Eliminate contact resistances in the plug connections.  
It must not be possible to shove spring contacts back.

#### Installation position of the components

Hot-wire air-mass sensor: Between the air filter and the intake manifold on the left in the engine compartment.

**D7**

Test chart for universal test adapter  
Volvo 240

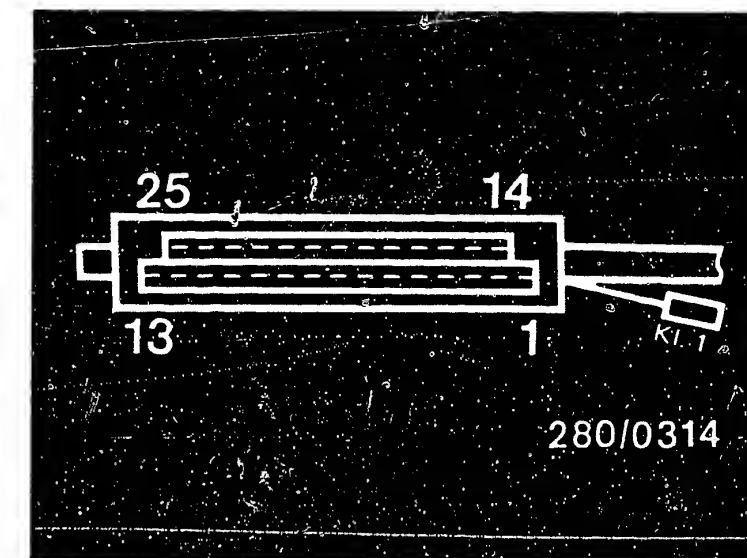


**D8**

Test chart for universal test adapter  
Volvo 240



TEST STEP 10 (Plug in only control unit plug of the adapter lead!)			
<u>Operation</u>		<u>Reading</u>	<u>Testing of periphery</u>
<u>Program switch "V" in setting</u>	4	Tester must read <u>8 ... 15 V</u>	Component: Starting motor
<u>Program switch "Ω" in setting</u>	21		
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>↓</div> <div>Continue testing with <u>next test step</u></div> <div>No</div> <div>↓</div>	<u>Operation:</u> Starting signal from the starting motor Term. 50 to the control unit Term. 4
<u>Scale:</u>	15 V		<u>Malfunction:</u> No reading for voltage
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground			
<u>Operation in vehicle:</u> Shift into neutral, start			



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity with an ohmmeter  
(Specified value approx. 0 Ω):

- From the control unit plug Term. 4 to the starting motor Term. 50.

Eliminate contact resistances in the plug connections.

If there is still no reading for voltage, check the starting equipment.

It must not be possible to shove spring contacts back.

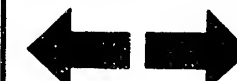
**D9**

Test chart for universal test adapter  
Volvo 240



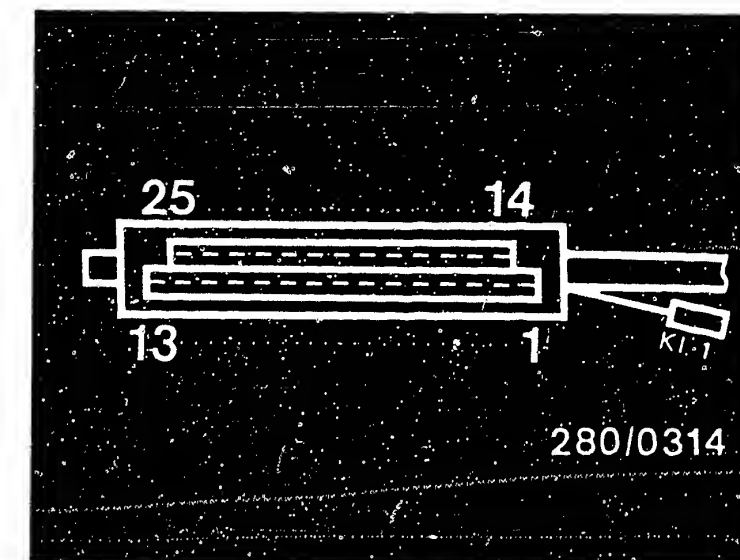
**D10**

Test chart for universal test adapter  
Volvo 240



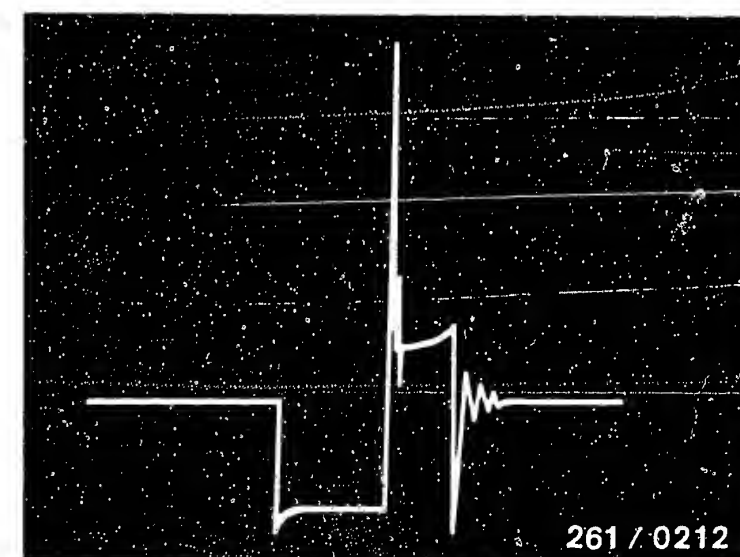


TEST STEP 11 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
Program switch "V" in setting	5	Primary signal displayed (see Fig. at bottom)	Component: Ignition coil, ignition leads, control unit
Program switch "Ω" in setting	21		
Test equipment: Motortester with oscilloscope		<div>Yes</div> <div>Continue testing with next test step</div> <div>No</div>	Operation: Primary signal from the ignition coil Term. 1 to ground
Scale: Special input Setting % and 10 V (if there)			Malfunction: No signal or incorrect signal
Connection: Test wells. Red clip to the red well, black clip to the black well. Trigger clamp to Cylinder 1			
Operation in vehicle: Ignition "ON". Shift into neutral, start.			



Top view of control unit plug

Primary signal from ignition coil Term. 1



#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (Specified value approx. 0 Ω):

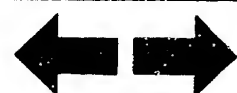
- From the control unit plug Term. 1 to the ignition coil Term.1.  
The terminal points on the ignition coil must be bright and the screws must be tightened firmly.
  - Is there voltage present at Term. 1 on the ignition coil?  
If not, check the ignition system.
- Eliminate contact resistances in the plug connections.  
It must not be possible to shove spring contacts back.

#### Installation position of the components

Ignition coil: On the left in the engine compartment, near the McPherson strut

**D11**

Test chart for universal test adapter  
Volvo 240



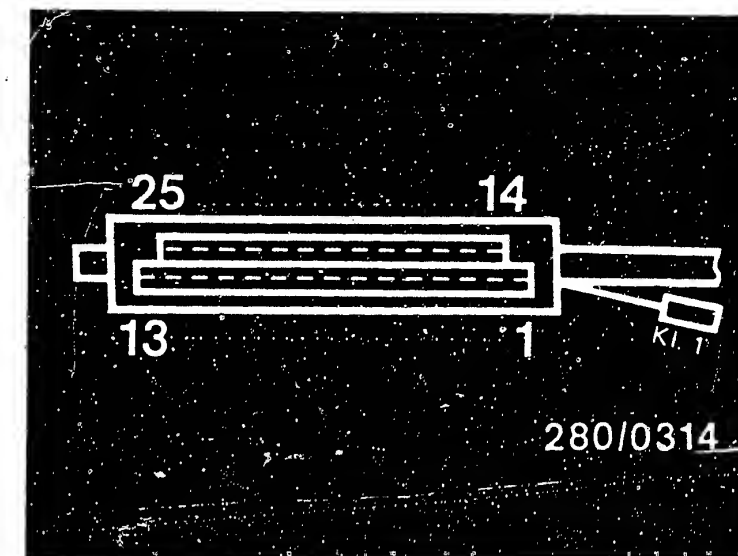
**D12**

Test chart for universal test adapter  
Volvo 240



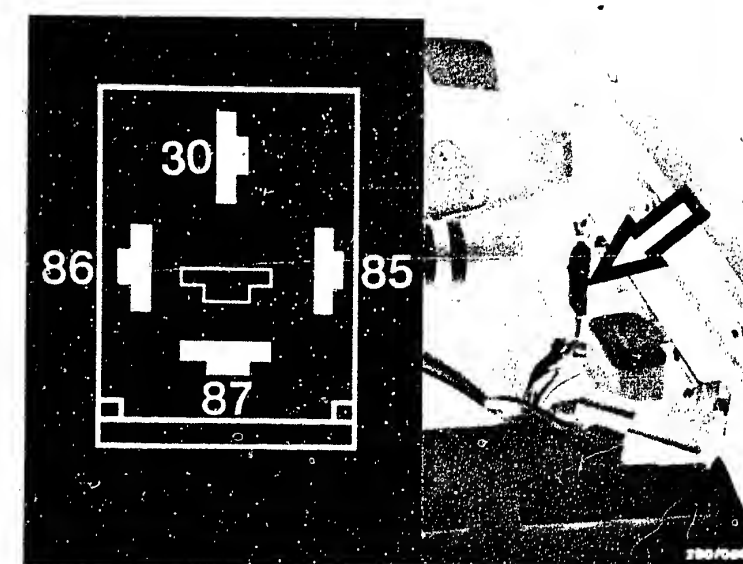


TEST STEP 12 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
Program switch "V" in setting	6	Tester must read 8 ... 15 V	Component: Main relay
Program switch "Ω" in setting	21		
Test equipment: Motortester or multimeter	<div>Yes</div> <div>Continue testing with next test step</div> <div>No</div>		Operation: Voltage supply from Term. 87
Scale: 15 V			Malfunction: No reading for voltage
Connection: Test socket/well red → positive Test socket/well black → ground			
Operation in vehicle: Ignition "ON".			
Press button 4			



Top view of control unit plug

Main and pump relays disconnected  
Top view of plug  
Arrow = Blade-type fuse



#### Trouble-shooting:

To test, disconnect control unit plug from the tester. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω):

- From the control unit plug Term. 9 to the main relay Term. 87.
- Caution! Disconnect the battery!
- From the main relay Term. 30 to the pump relay Term. 30.
- From the pump relay Term. 30 to the 25 A blade-type fuse near the ignition coil, and after that to the positive connection of the battery.
- From the main relay Term. 30 to the main relay Term. 86.
- From the main relay Term. 85 to the control unit plug Term. 21.

If the leads are OK but the test specification is not being met, take out and replace the main relay. After testing, reconnect the battery.

Eliminate contact resistances in the plug connections.  
It must not be possible to shove spring contacts back.

#### Installation position of the components

Main and pump relays: In the passenger compartment, at the bottom left in the front passenger's footwell next to the LH-control unit.

**D 13**

Test chart for universal test adapter  
Volvo 240

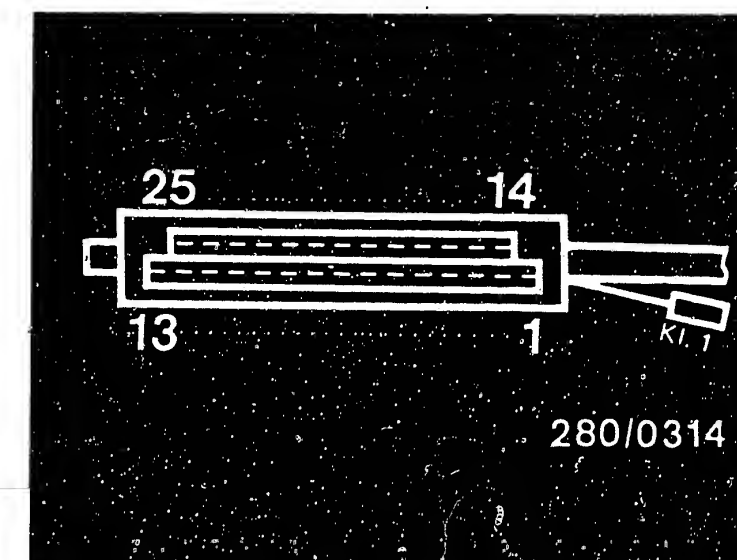


**D 14**

Test chart for universal test adapter  
Volvo 240



TEST STEP 13 (Plug in only control unit plug of the adapter lead!)			
<u>Operation</u>		<u>Reading</u>	<u>Testing of periphery</u>
<u>Program switch "V" in setting</u>	7	Tester must read <u>8 ... 15 V</u>	Component: Ignition Lock
<u>Program switch "Ω" in setting</u>	21		
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>↓</div> <div>No</div> <div>↓</div>	<u>Operation:</u> Voltage supply with Term. 15 for the control unit Term. 18
<u>Scale:</u> 15 V			<u>Malfunction:</u> No voltage supply
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground			
<u>Operation in vehicle:</u> Ignition "ON"			
		<u>Continue testing with next test step</u>	



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter

(Specified value approx. 0 Ω):

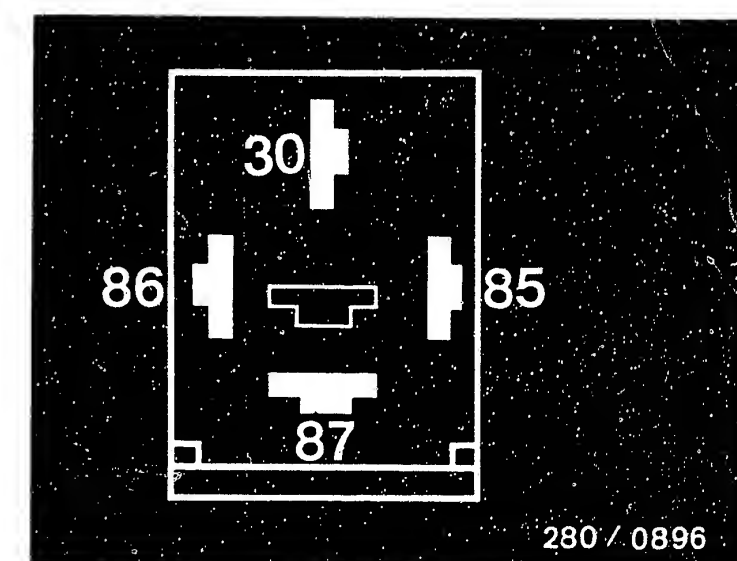
- From the control unit plug Term. 18 to the pump relay Term. 86.
- From the pump relay Term. 86 to fuse No. 12.
- After the fuse to the ignition lock Term. 15.

Eliminate contact resistances in the plug connections.  
It must not be possible to shove spring contacts back.

#### Installation position of the components

- Pump relay: In the passenger compartment, at the bottom left in the front passenger's footwell, next to the LH-control unit.
- Fuse No. 12: In the fuse box at the left in the driver's footwell, A-pillar.

Main or pump relay disconnected.  
Top view of plug



**D15**

Test chart for universal test adapter  
Volvo 240

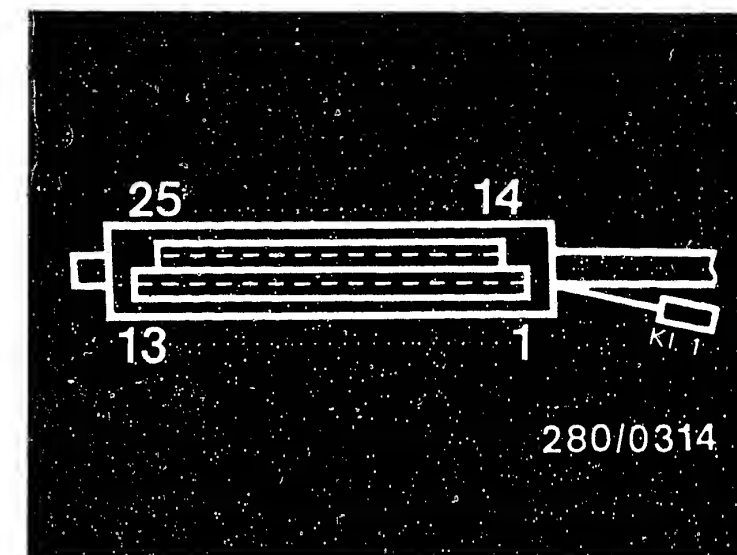


**D16**

Test chart for universal test adapter  
Volvo 240

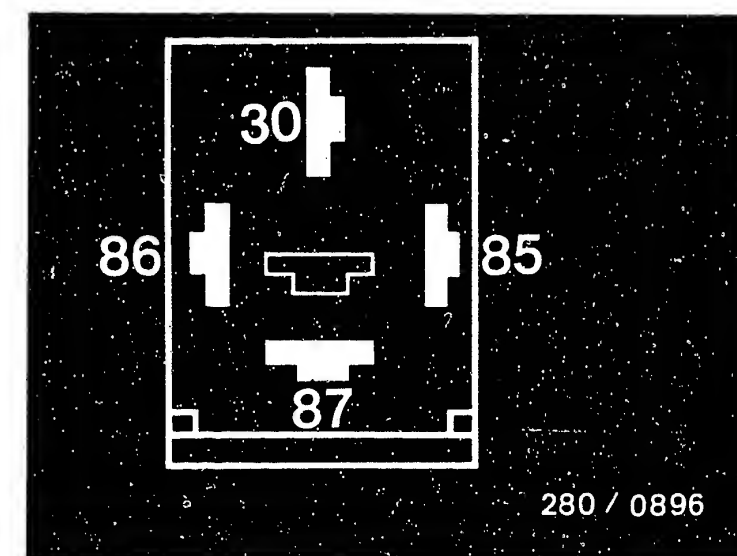


TEST STEP 14 (Plug in only control unit plug of the adapter lead!)			
Operation		Reading	Testing of periphery
Program switch "V" in setting	8	Tester must read 8 ... 15 V	Component: Main relay
Program switch "Ω" in setting	21		
Test equipment: Motortester or multimeter	<div>Yes</div> <div>↓</div> <div>Continue testing with next test step</div>	<div>No</div> <div>↓</div>	Operation: Main relay - coil and ground connection Term. 21
Scale: 15 V			Malfunction: No reading for voltage
Connection: Test socket/well red → positive Test socket/well black → ground			
Operation in vehicle: Ignition "ON"			



Top view of control unit plug

Main or pump relay disconnected  
Top view of plug



#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω):

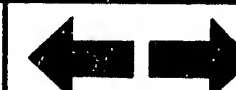
- From the control unit plug Term. 21 to the main relay Term. 85.

Eliminate contact resistances in the plug connections.

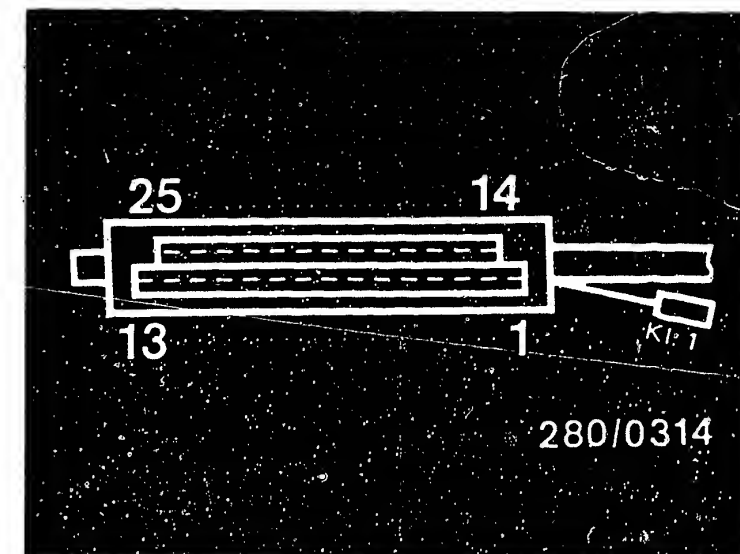
It must not be possible to shove spring contacts back.

#### Installation position of the components

Main relay: In the passenger compartment, at the lower left in the front passenger's footwell, next to the LH-control unit.

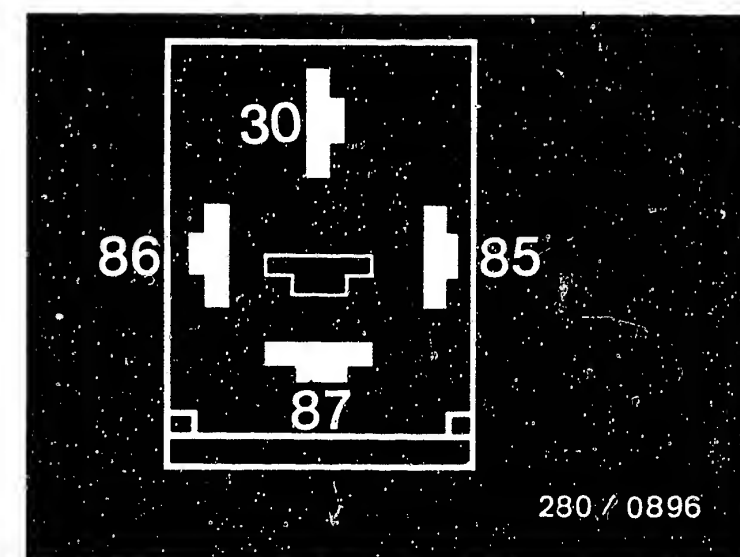


TEST STEP 15 (Plug in only control unit plug of the adapter lead!)							
Operation		Reading		Testing of periphery			
<u>Program switch "V" in setting</u>		9		Tester must read <u>8 ... 15 V</u>		Component: Pump relay	
<u>Program switch "Ω" in setting</u>		21					
Test equipment: Motortester or multimeter		Yes		No		Operation: Pump relay - coil and ground connection Term. 17	
<u>Scale:</u> 15 V		Continue testing with next test step				Malfunction: No reading for voltage	
Connection: Test socket /well red → positive Test socket/well black → ground							
<u>Operation in vehicle:</u> Ignition "ON"							



Top view of control unit plug

Main or pump relay disconnected  
Top view of plug



#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω ):

- From the control unit plug Term. 17 to the pump relay Term. 85.

Eliminate contact resistances and the plug connections.

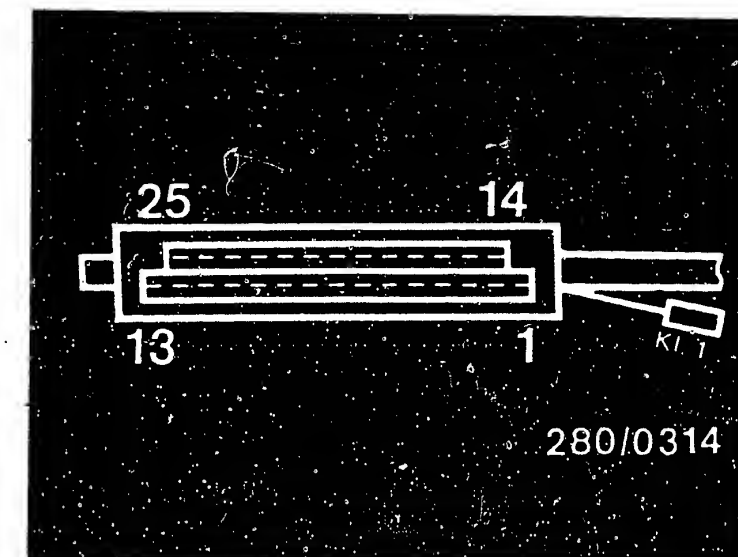
It must not be possible to shove spring contacts back.

#### Installation position of the components

Pump relay: In the passenger compartment, at the lower left in the front passenger's footwell, next to the LH-control unit.



TEST STEP 16 (Not used for vehicles without air conditioner)		Ignition "OFF". Connect adapter lead to control unit and periphery!	
Operation		Reading	Testing of periphery
Program switch "V" in setting	10	Tester must read 8 ... 15 V	Component: Air conditioner switch
Program switch "Ω" in setting	21		
Test equipment: Motortester or multimeter		<div>Yes</div> <div>Continue testing with next test step</div> <div>No</div>	Operation: Voltage signal at control unit Term. 16  Malfunction: No reading for voltage
Scale:	15 V		
Connection: Test socket/well red → positive Test socket/well black → ground			
Operation in vehicle: Ignition "ON". Have engine run. Switch air conditioner on.			



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter  
(Specified value approx. 0 Ω):

- From the control unit plug Term. 16 to the air conditioner switch.
- From the air conditioner switch to the ignition lock Term. 15.

If there is voltage at Term. 15 and at the air conditioner switch, and the lead is OK, take out and replace the air conditioner switch.

Eliminate contact resistances in the plug connection.  
It must not be possible to shove spring contacts back.

#### Installation position of the components

Air conditioner: Air conditioner switch at the center of the dashboard.





# **TEST STEP 17** Connect adapter lead to control unit and periphery!

Operation		Reading		Testing of periphery	
Program switch "V" in setting	3	Tester must read <u>2 ... 5 V</u>		Component: Hot-wire air-mass sensor	
Program switch "Ω" in setting	21				
Test equipment: Motortester or multimeter		Yes  ↓  Continue testing with <u>next test step</u>	No  ↓	Operation: Output voltage between Term. 7 and Term. 6	
Scale: 10 V				Malfunction: No reading for voltage No change in voltage	
Connection: Test socket/well red → positive Test socket/well black → ground					
Operation in vehicle: Have engine run. When engine speed changes, output voltage must also change					

## **Trouble-shooting:**

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter

(Specified value of approx. 0 Ω):

- From control unit plug Term. 7 to the air-mass sensor Term. 7.
- From the air-mass sensor Term. 36 to the ground terminal for the electronic system.
- From the air-mass sensor Term. 9 to the main relay Term. 87.

Note: When the engine speed changes, the output voltage must also change.

Eliminate contact resistances in the plug connections.

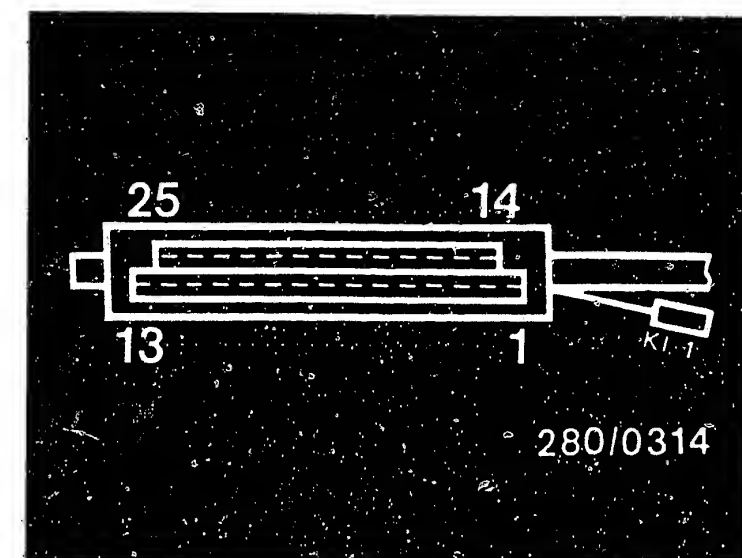
It must not be possible to shove spring contacts back.

Installation position of the components

**Air-mass sensor:** Between the air filter and the intake manifold on the left in the engine compartment.

**Ground terminal:** Under the front fastening screw for the fuel distribution pipe, at the center of the engine compartment.

**Main relay:** In the passenger compartment, on the left in the front passenger's footwell, next to the LH-control unit

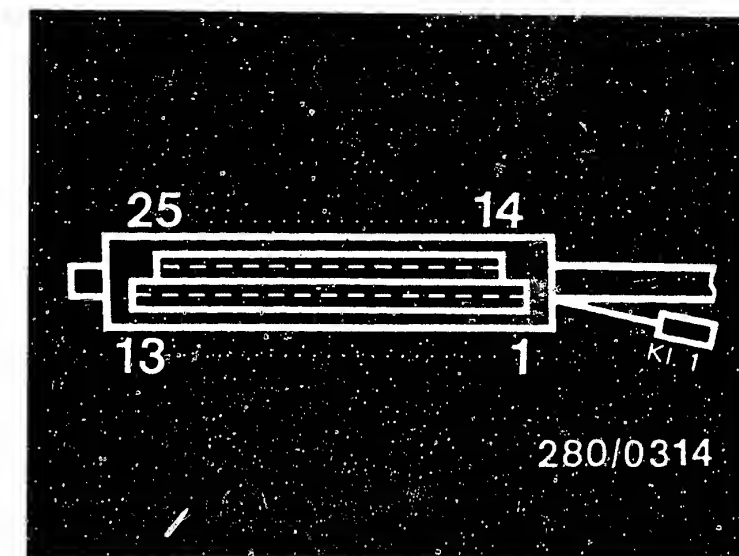


Top view of control unit plug



# **TEST STEP 18** Connect adapter lead to control unit and periphery!

Operation		Reading	Testing of control unit	
<u>Program switch "V" in setting</u>	11	Tester must read <u>1 ... 3 V</u>	Component: <u>Control unit</u>	
<u>Program switch "Ω" in setting</u>	21*			
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>No</div>	<div>Operation: <u>Lambda closed-loop control, open-loop control value Term. 22</u></div> <div>Malfunction: <u>value for voltage not within tolerance</u></div>	
<u>Scale:</u> 5 V				
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground				
<u>Operation in vehicle:</u> Have the engine run at normal operating temperature				
		Continue testing with next test step		



Top view of control unit plug

## Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

Check the following leads for continuity with an ohmmeter (Specified value approx. 0 Ω):

- From the control unit plug Term. 22 to the test connection.

Eliminate contact resistances in the plug connections.

It must not be possible to shove spring contacts back.

If no defect can be found and the reading is nevertheless incorrect, take out and replace the control unit.

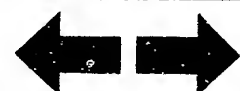
\* Settings 22, 23, and 24 for the Ω switch are not allowed!

## Installation position of the components

Test connection: On the left in the engine compartment, near the ignition coil, 2-pole plug connection (pink lead)

**E1**

Test chart for universal test adapter  
Volvo 240



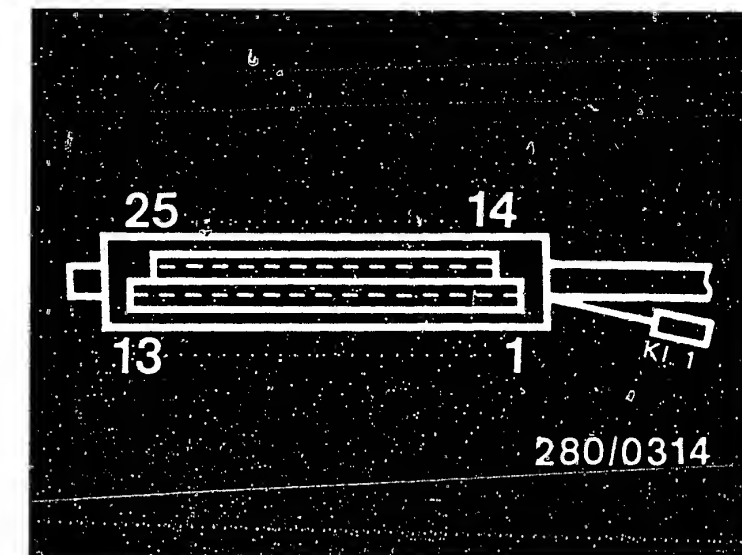
**E2**

Test chart for universal test adapter  
Volvo 240





TEST STEP 19      Connect adapter lead to control unit and periphery!			
<u>Operation</u>		<u>Reading</u>	<u>Testing of control unit</u>
<u>Program switch "V" in setting</u>	11	Tester must read <u>2 ... 3.5 V</u>  (Wait for steady reading.)	<u>Component:</u>  Control unit
<u>Program switch "Ω" in setting</u>	22		
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>↓</div> <div>Continue testing with next test step</div> <div>No</div> <div>↓</div>	<u>Operation:</u> Lambda closed-loop control, rich value Term. 22  <u>Malfunction:</u> Reading for voltage not within tolerance
<u>Scale:</u> 5 V			
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground			
<u>Operation in vehicle:</u> Have the engine run at normal operating temperature			



Top view of control unit plug

#### Trouble-shooting:

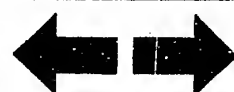
To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

The reading for voltage must rise slowly to the specified value. The CO must increase!

If no defect can be found, and the reading is nevertheless incorrect, take out and replace the control unit.

**E3**

Test chart for universal test adapter  
Volvo 240

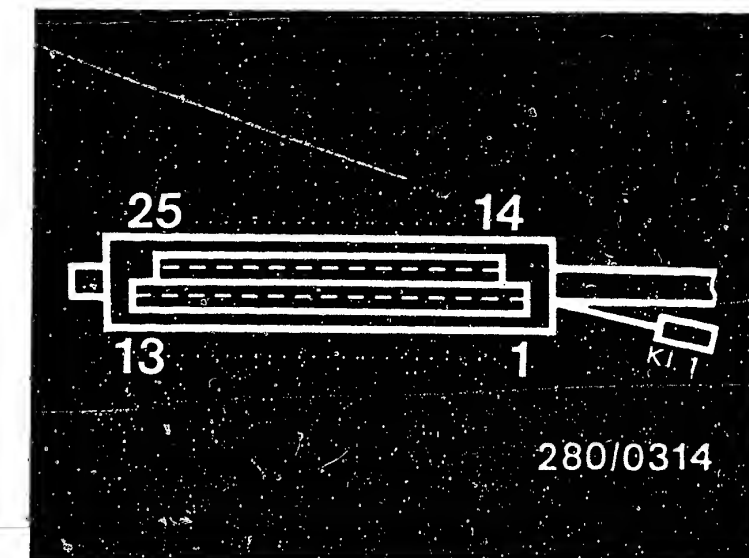


**E4**

Test chart for universal test adapter  
Volvo 240



TEST STEP 20    Connect adapter lead to control unit and periphery!				
<u>Operation</u>		<u>Reading</u>	<u>Testing of control unit</u>	
<u>Program switch "V" in setting</u>	11	Tester must read <u>less than 0.5 V</u>  (Wait for steady reading.)	<u>Component:</u> Control unit	
<u>Program switch "Ω" in setting</u>	23			
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>↓</div> <div>Continue testing with <u>next test step</u></div>	<u>Operation:</u> Lambda closed-loop control Lean value, Term. 22	
<u>Scale:</u> 5 V				
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground			<div>No</div> <div>↓</div>	<u>Malfunction:</u> Reading for voltage greater than tolerances indicated
<u>Operation in vehicle:</u> Have the engine run at normal operating temperature				



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

The reading for voltage must slowly cut back to the specified value.

If no defect can be found and the reading is nevertheless incorrect, take out and replace the control unit.

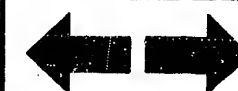
**E5**

Test chart for universal test adapter  
Volvo 240

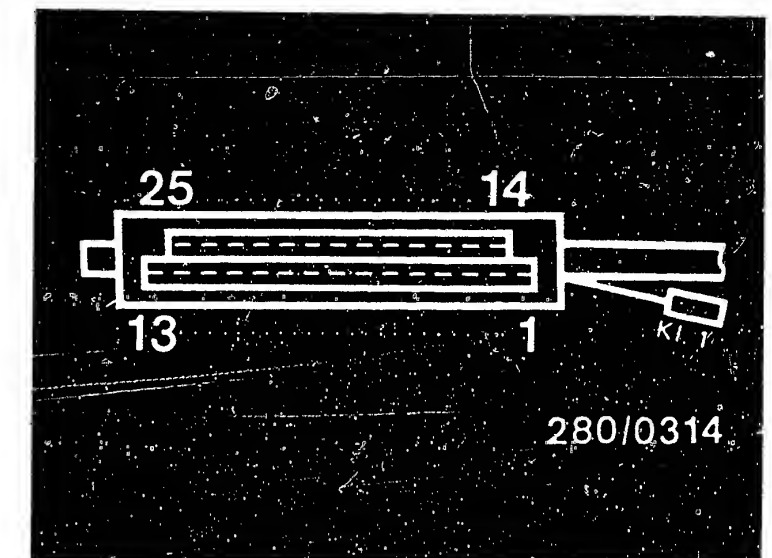


**E6**

Test chart for universal test adapter  
Volvo 240



TEST STEP 21    Connect adapter lead to control unit and periphery!			
Operation		Reading	Testing of control unit
<u>Program switch "V" in setting</u>	11	Tester must read <u>0 ... 3 V</u> (alternating)	Component: <u>Control unit</u>
<u>Program switch "Ω" in setting</u>	24		
<u>Test equipment:</u> Motortester or multimeter		<div>Yes</div> <div>↓</div> <div>Continue testing with next test step</div> <div>No</div> <div>↓</div>	<u>Operation:</u> Lambda closed-loop control Closed-loop control value Term. 22
<u>Scale:</u> 5 V			
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground			<u>Malfunction:</u> Voltage constant or not within tolerance
<u>Operation in vehicle:</u> Have the engine run at normal operating temperature			



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

The reading must fluctuate back and forth between the lean value of approx. 0 V and rich value of up to approx. 3 V. (The engine and the sensor must be hot!)

If the reading remains constant or not within tolerance:

- Check the periphery.
- Run the vehicle until warm, and repeat the test.
- Adjust at the CO trimming potentiometer until the reading oscillates.
- If no fault can be found but the reading is still incorrect → check lambda closed-loop control system.

**E7**

Test chart for universal test adapter  
Volvo 240

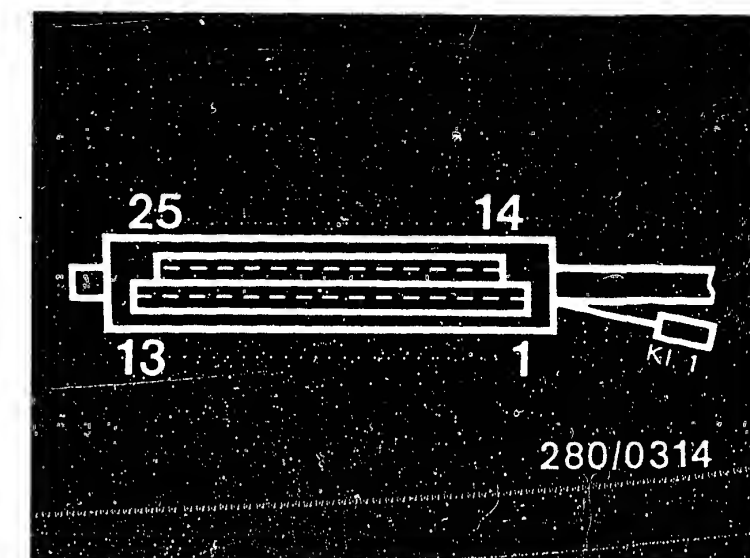


**E8**

Test chart for universal test adapter  
Volvo 240



TEST STEP 22    Connect adapter lead to control unit and periphery!			
Operation		Reading	Testing of control unit
<u>Program switch "V" in setting</u>	11	Tester must read <u>650 ... 700 min<sup>-1</sup></u> <u>730 ... 770 min<sup>-1</sup> 1)</u>	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting</u>	24		
<u>Test equipment:</u> Motortester or multimeter Pocket-Tester		<div><div>Yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div><div>No</div><div>↓</div></div>	<u>Operation:</u> Basic setting for idle via test pin Term. 15
<u>Scale:</u> Engine speed range			<u>Malfunction:</u> Engine speed not within tolerance
<u>Connection:</u> Ignition coil Term.15 & Term.1			
<u>Operation in vehicle:</u> Have the engine run at normal operating temperature.			
<u>Press button 3</u>			



Top view of control unit plug

- 1 = 2-pole plug connection, blue/white lead = test pin
- 2 = Adjusting screw for basic engine speed
- 3 = Potentiometer for idle-mixture adjustment



#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

- If there is no change in engine speed when button 3 is pressed, take out and replace the control unit.
- If the engine speed is not within tolerance when button 3 is pressed:  
Ground test pin (blue/white lead). Make certain connection is good. Adjust speed using the idle-speed-adjusting screw to 650...700 min<sup>-1</sup>.  
If the speed cannot be adjusted,
- Check that there is a good ground connection for the test pin.
- Take out and replace the control unit.

1) = Reading when button 3 is not being pressed.

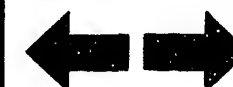
**E9**

Test chart for universal test adapter  
Volvo 240

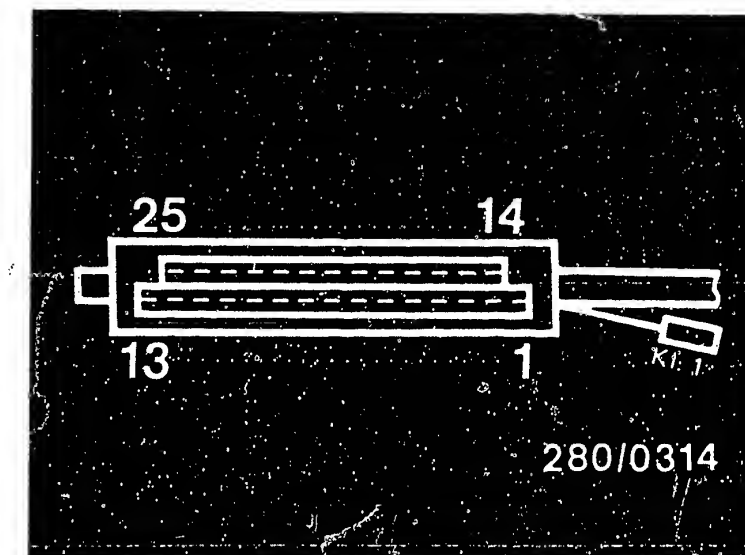


**E10**

Test chart for universal test adapter  
Volvo 240



TEST STEP 23    Connect adapter lead to control unit and periphery!			
Operation		Reading	Testing of control unit
Program switch "V" in setting	11	Tester must read 25 ... 29 %	Component Control unit
Program switch "Ω" in setting	24	22 ... 26 %    1) 30 ... 34 %    2) 33 ... 37 %    3)	
Test equipment: Motortester or Pocket-Tester		Greater than 37 %    4)	
Scale: Dwell angle 100%			Operation: Triggering of the idle actuator Term. 9 and Term. 23
Connection: Black test sockets No. 1 and 2			
Operation in vehicle: Run engine at normal operating temperature. Further information at *		<div>Yes</div> <div>Continue testing with next test step</div>	Malfunction: On/off ratio is not within tolerance
		<div>No</div> <div></div>	



Top view of control unit plug

- \*1) = Reading for : Button 3 is pressed.  
 2) = Reading for : Step on gas, hold engine speed at less than 2000 min<sup>-1</sup>.  
 3) = Reading for : Engine speed less than 2000 min<sup>-1</sup> but above idle speed. In addition, switch air conditioner on (if there is one).  
 4) = Reading for : Step on accelerator, engine speed above 3000 min<sup>-1</sup>. The on/off ratio must increase.

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

If the reading is not within tolerance, check whether or not the correct settings have been made.

If the settings are OK, take out and replace the control unit.

**E11**

Test chart for universal test adapter  
Volvo 240



**E12**

Test chart for universal test adapter  
Volvo 240



# TEST STEP 24 Connect adapter lead to control unit and periphery!

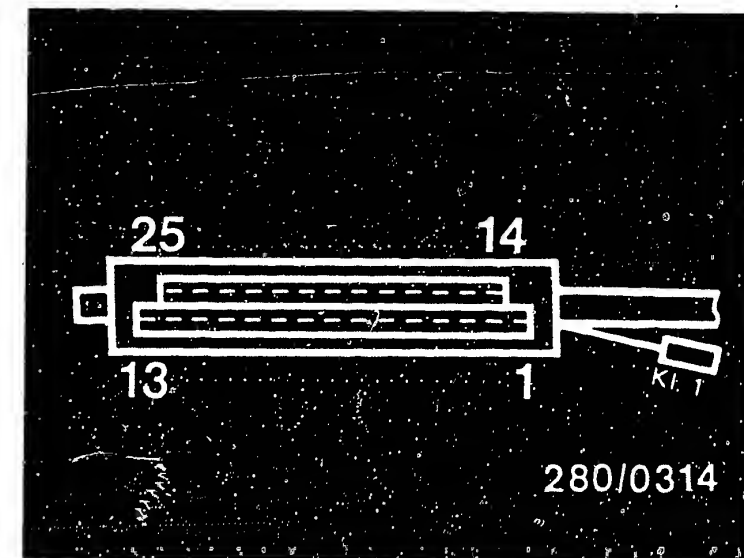
Operation		Reading	Testing of control unit
<u>Program switch "V" in setting</u>	12	Tester must indicate a fuel-injection signal (see Fig. at bottom).	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting</u>	24		
<u>Test equipment:</u> Ignition oscilloscope		<div><div>Yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div><div>No</div><div>↓</div><div>Malfunction: No fuel-injection signal or incorrect signal</div></div>	<u>Operation:</u> Output stage
<u>Scale:</u> ms or 20 V special input			
<u>Connection:</u> Test sockets/well red → positive Test sockets/well black → ground			
<u>Operation in vehicle:</u> Have engine run at normal operating temperature			

## Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary use a wiring diagram.

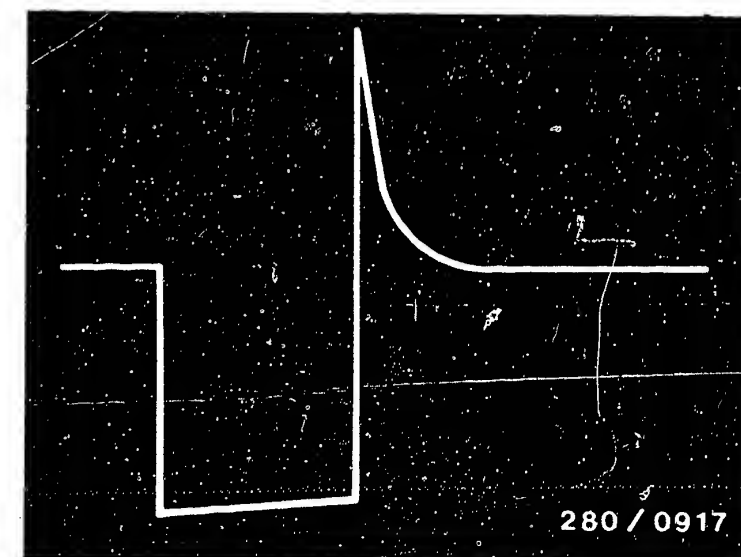
If there is no fuel-injection pulse visible on the oscilloscope, change the triggering (clamp the clamp-on pick-up on a different cylinder.)

If there is no fuel-injection signal, or an incorrect signal, take out and replace the control unit.



Top view of control unit plug

Fuel-injection signal



E13

Test chart for universal test adapter  
Volvo 240



E14

Test chart for universal test adapter  
Volvo 240





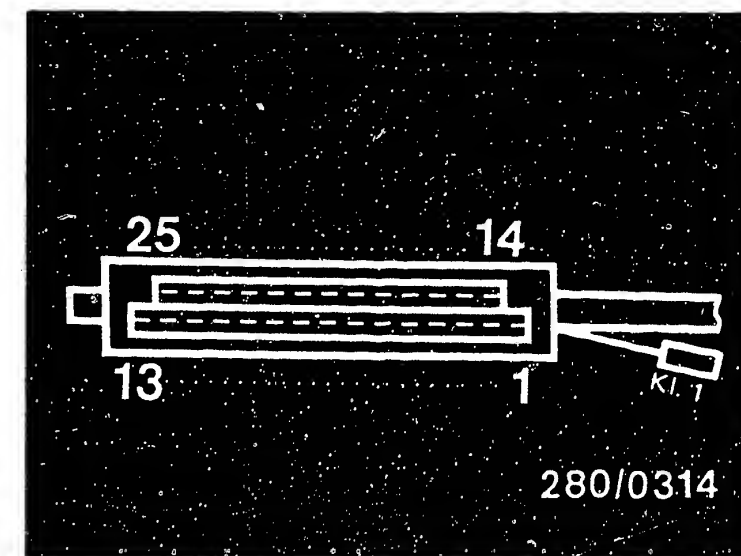
# **TEST STEP 25** Connect adapter lead to control unit and periphery!

Operation		Reading	Testing of control unit
Program switch "V" in setting	12	Tester must indicate a fuel-injection signal. After button T1 is pressed (NTC II - cold), the fuel-injection signal must become wider. (See Fig. at bottom)	Component: Control unit
Program switch "Ω" in setting	24		
Test equipment: Ignition oscilloscope			Operation: Effect of temperature, cold (engine)
Scale: ms or 20 V special input		<div> <div>Yes</div> <div>Continue testing with next test step</div> </div> <div>No</div>	Malfunction: The fuel-injection signal does not become broader after pressing button T1.
Connection: Test socket/well red → positive Test socket/well black → ground			
Operation in vehicle: Have engine run at normal operating temperature			
Press button 1			

## Trouble-shooting:

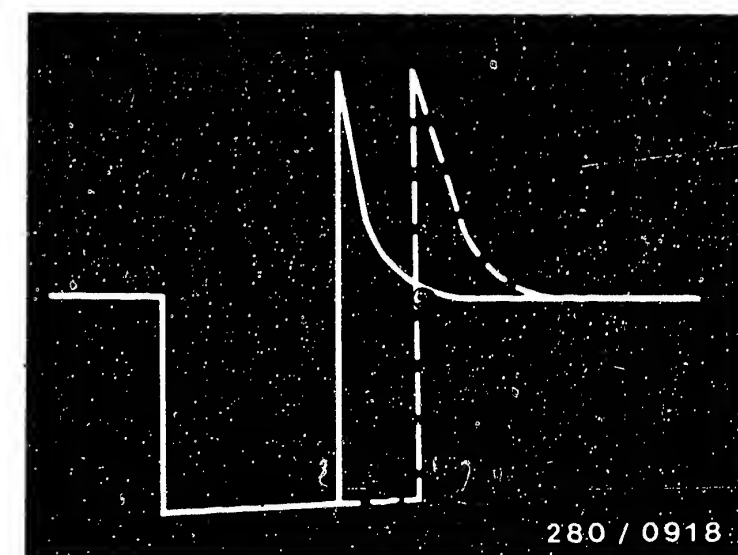
To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

If the fuel-injection pulse does not become broader, take out and replace the control unit.



Top view of control unit plug

Broader fuel-injection signal after button T1 is pressed



**E15**

Test chart for universal test adapter  
Volvo 240



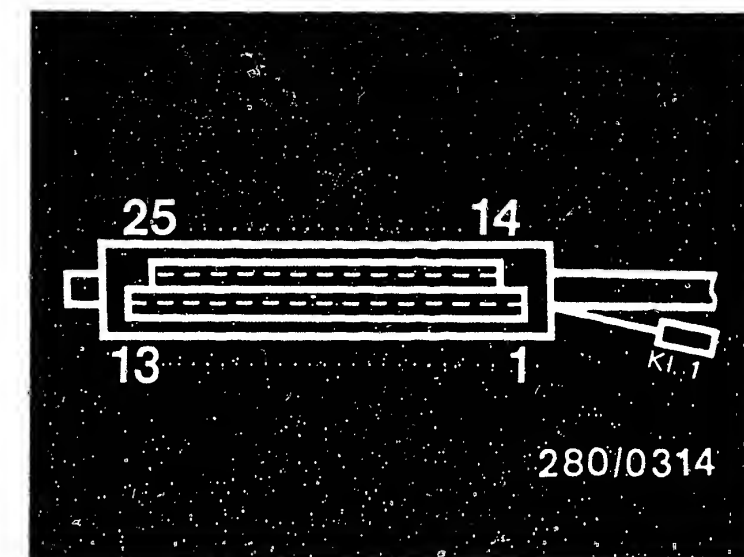
**E16**

Test chart for universal test adapter  
Volvo 240

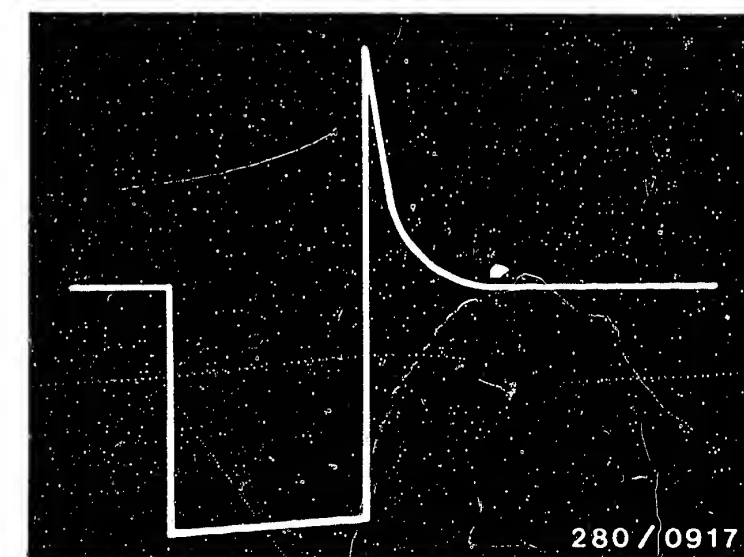




TEST STEP 26   Connect adapter lead to control unit and periphery!			
Operation		Reading	Testing of control unit
<u>Program switch "V" in setting</u>	12	Tester must show a fuel-injection signal.  After button T2 is pressed, the fuel-injection signal must not become broader. (See Fig. at bottom).	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting</u>	24		
<u>Test equipment:</u> Ignition oscilloscope			<div><div>Yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div><div>No</div><div>↓</div></div>
<u>Scale:</u> ms or 20 V special input		<u>Malfunction:</u> The fuel-injection signal becomes broader after button T 2 is pressed.	
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground			
<u>Operation in vehicle:</u> Have engine run at normal operating temperature.			
Press button 2			



Top view of control unit plug



### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

The fuel-injection signal must not become broader.

If the fuel-injection signal does nevertheless become broader, the engine is not at normal operating temperature.

Have the engine run for approx. 5 min. at 3000 min<sup>-1</sup>.

Repeat the test.

If the defect has not been corrected, take out and replace the control unit.

# TEST STEP 27 Connect adapter lead to control unit and periphery!

Operation		Reading	Testing of control unit
<u>Program switch "V" in setting</u>	12	<u>For a short time the tester must not show any fuel-injection signals*</u>	<u>Component:</u> Control unit
<u>Program switch "Ω" in setting</u>	24		
<u>Test equipment:</u> Ignition oscilloscope			
<u>Scale:</u> ms or 20 V special input			<u>Operation:</u> Overrun cutoff
<u>Connection:</u> Test socket/well red → positive Test socket/well black → ground		<div>Yes</div> <div>↓</div> <div>Continue testing with next test step</div>	<u>Malfunction:</u> Fuel-injection signals
<u>Operation in vehicle:</u> Have the engine run at normal operating temperature		<div>No</div> <div>↓</div>	
Press button 5			

## Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

\* Hold engine speed constant at 2000 min<sup>-1</sup>.

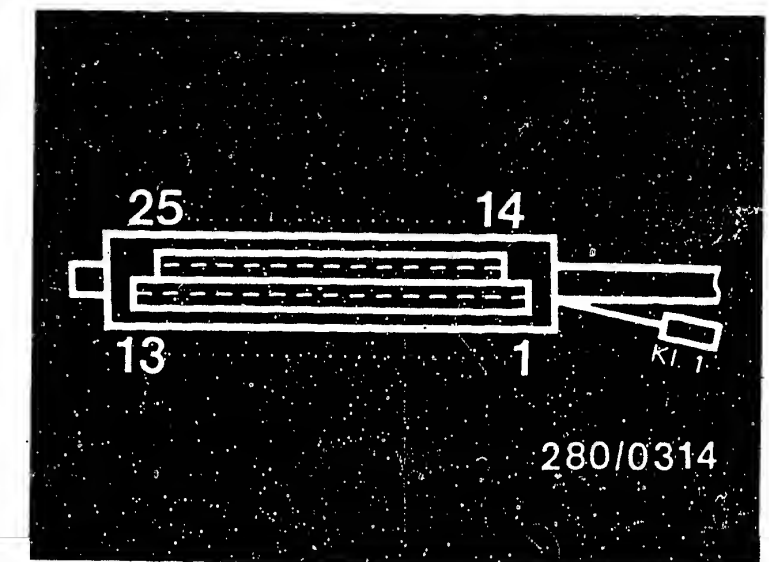
Press button 5.

Fuel-injection signals disappear and return at approx. 1300 min<sup>-1</sup>.

Release button 5, and press it again (holding engine speed constant):

The process must repeat.

If not, take out and replace the control unit.



Top view of control unit plug

**E19**

Test chart for universal test adapter  
Volvo 240



**E20**

Test chart for universal test adapter  
Volvo 240



# **TEST STEP 28** Connect adapter lead to control unit and periphery!

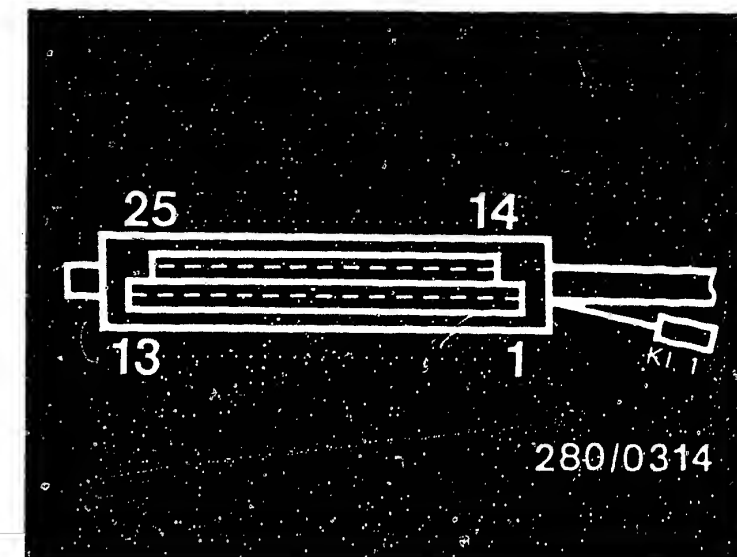
Operation		Reading	Testing of control unit
Program switch "V" in setting	12	The tester must show a fuel-injection signal.  After button T6 is pressed (full load enrichment), the fuel-injection signal must become somewhat broader. (See Fig. at bottom).	Component: Control unit
Program switch "Ω" in setting	24		
Test equipment: Ignition oscilloscope			Operation: Full load enrichment
Scale: ms or 20 V special input			
Connection: Test socket/well red → positive Test socket/well black → ground		Yes  ↓  Continue testing with next test step	Malfunction: Fuel-injection signal does not become broader
Operation in vehicle: Have the engine run at normal operating temperature		No  ↓	
Press button 6			

## **Trouble-shooting:**

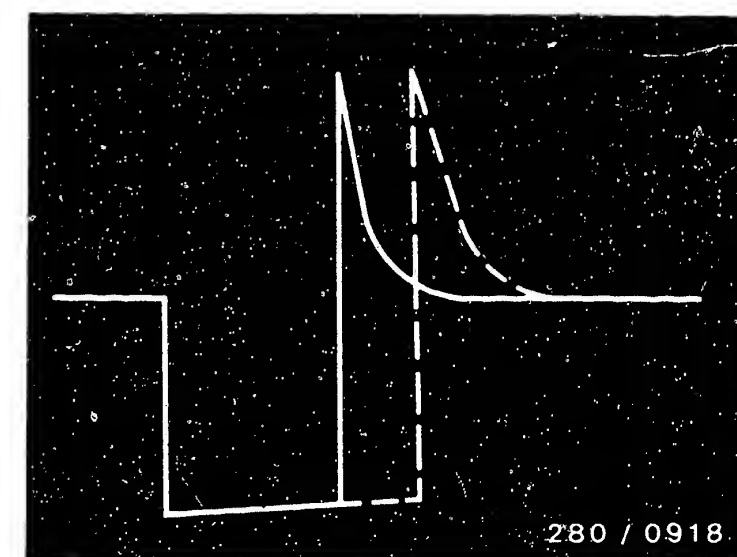
To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

If the fuel-injection pulse does not become broader, the engine speed must increase.

If the fuel-injection signal does not become somewhat broader, and the engine speed does not increase, take out and replace the control unit.



Top view of control unit plug



**E21**

Test chart for universal test adapter  
Volvo 240

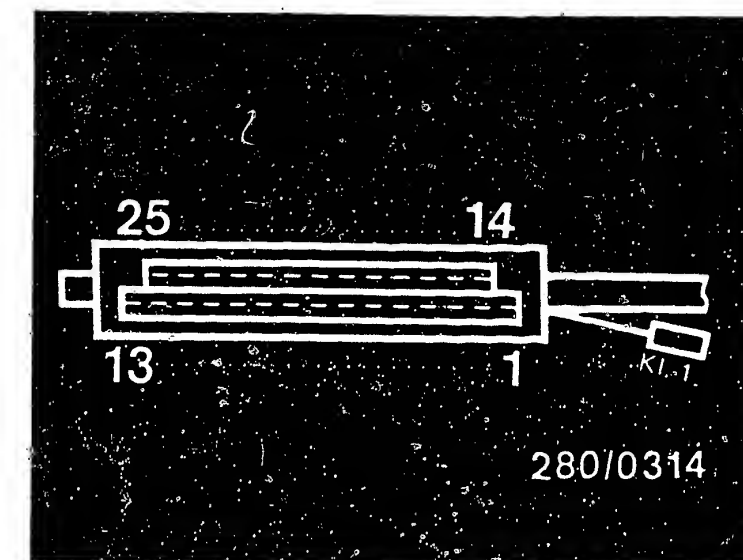


**E22**

Test chart for universal test adapter  
Volvo 240



TEST STEP 29 Connect adapter lead to control unit and periphery!			
Operation		Reading	Testing of control unit
Program switch "V" in setting	13	After approx. 4 sec, the tester must show a reading for voltage of 2 ... 5 V (Duration of reading approx. 1 sec.).	Component: Control unit
Program switch "Ω" in setting	24		
Test equipment: Motortester or multimeter			Operation: Self-cleaning (Term. 8 to Term. 11)
Scale:	10 V		
Connection: Test socket/well red → positive Test socket/well black → ground		Yes	Malfunction: Continuous pulse or no pulse
Operation in vehicle: Have engine run at normal op. temp. at min. 2000 min <sup>-1</sup> . Then ignition "OFF".		No	
		Testing with the universal test adapter has been completed!*	



Top view of control unit plug

#### Trouble-shooting:

To test, disconnect control unit plug from the test adapter. If necessary, use a wiring diagram.

If the self-cleaning pulse is not as indicated under reading, take out the hot-wire air-mass sensor, leaving the plug plugged in.

Repeat test step 29, and observe the hot wire.

The hot wire must glow after approx. 4 sec. for approx. 1 sec.

If the hot wire glows: ● Check the connections and/or the setting for the tester!

If the hot wire does not glow: ● Is the engine temperature less than 60°C? Warm the engine up.

● The hot wire with the hot-wire air-mass sensor is broken. Take out and replace the hot-wire air-mass sensor.

● The control unit is defective. Take it out and replace it.

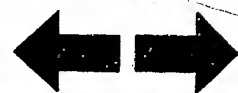
\*Testing with the universal tester adapter has been completed. The fuel pressure test must now be run.

If a defect is found in one of the tests, that test must be repeated after correction of the defect.

The fuel pressure test is described at Coordinates F1...F10.

**E23**

Test chart for universal test adapter  
Volvo 240



**E24**

Test chart for universal test adapter  
Volvo 240



## FUEL PRESSURE TEST

Yes

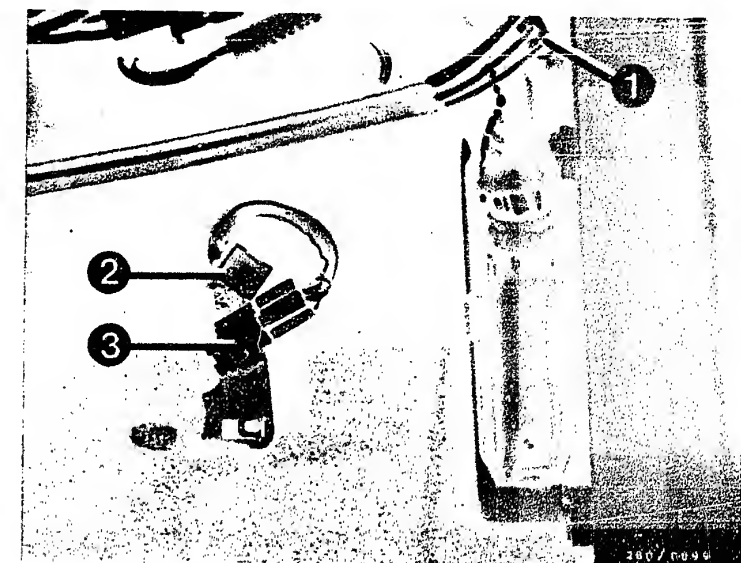
Are the electric fuel pump  
and the pre-supply pump  
running?  
Check by listening.

No

Yes

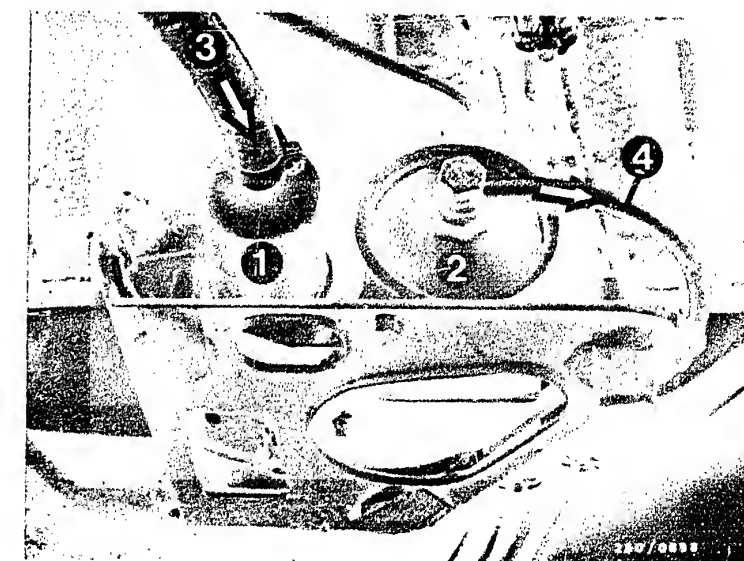
Continued on F3/F4

- Check pump fuses.  
Remove the panel on the right under the dash-board. Take apart the 3-pole lead plug. Jump the blue-red and the blue-yellow leads. Switch the ignition on. The pre-supply and the electric fuel pumps must run.
- Are both pumps running?  
If not, check fuse No. 12 (in the central fuse box, at the bottom left on the driver's side) and lead connections.
- Is the pre-supply pump running?  
If not, check fuse No. 5 (in the central fuse box, at the bottom left on the driver's side). Check the lead connections.  
Check the pre-supply pump (ground lead on the left in the trunk compartment, brown lead under a cover.)
- Is the electric fuel-injection pump running?  
If not, check fuse No. 7 (in the central fuse box, on the left in the driver's foot-well).  
Check lead connections.  
Check the electric fuel pump (ground connection under the rear bench seat on the left).
- Measure voltage directly on the pre-supply and electric fuel pumps. (Start the engine).  
Specified value min. 12 V.  
If the pump(s) is (are) not running even though there is voltage, take out and replace the pump in question.



1 = 3-pole lead plug

1 = Electric fuel pump  
2 = Fuel filter  
3 = Fuel suction line  
4 = Fuel delivery line



**F1**

Fuel pressure test  
Volvo 240



**F2**

Fuel pressure test  
Volvo 240



## Fuel pressure test (continued)

Is the fuel pressure OK?

- Test specification:  
2.3...2.7 bar

Is the test specification  
being met?

No

- Check fuel pressure  
Connect pressure gauge (1) or pressure  
tester.  
Unscrew fuel delivery line at the fuel  
distribution pipe.

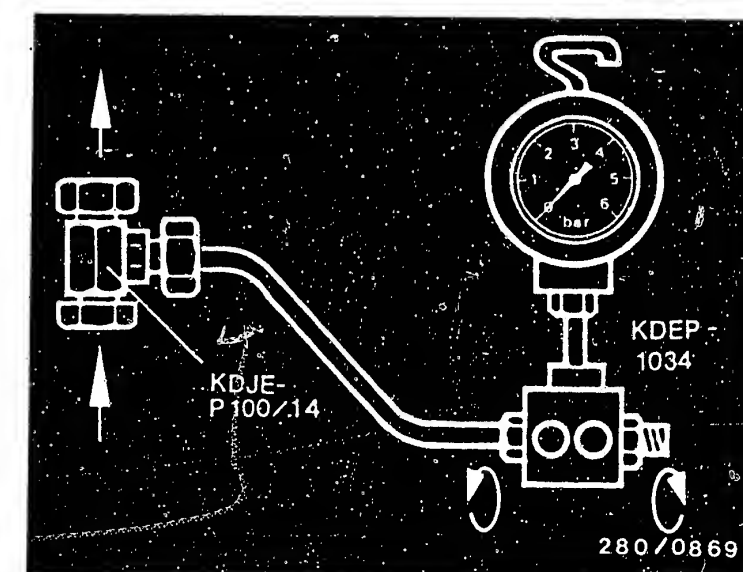
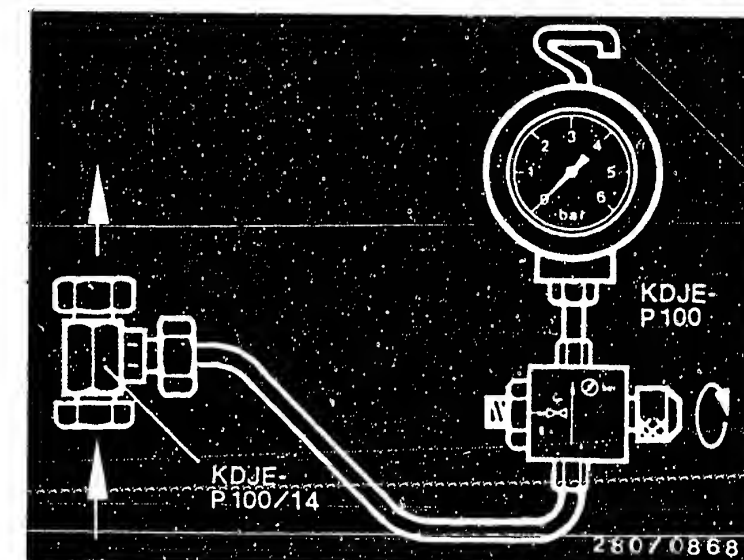
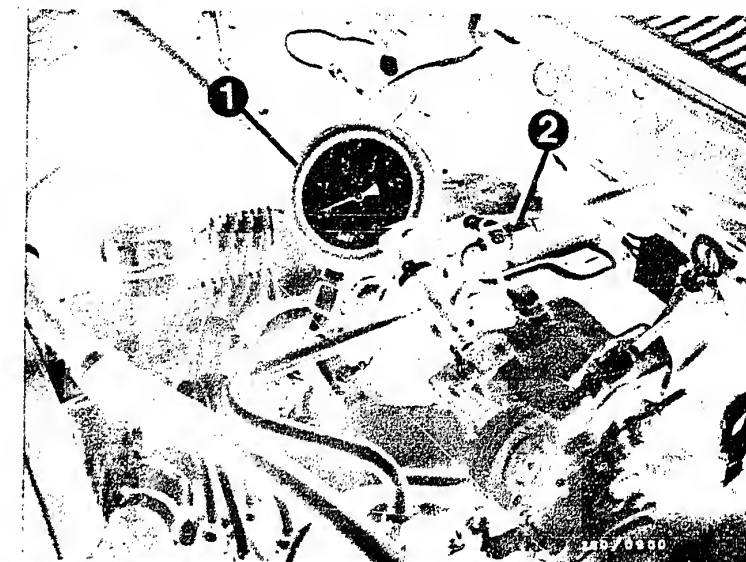
Caution! When unscrewing the hose, make  
certain that no fuel gets on hot portions  
of the engine.

- Put in connector KDJE-P100/14 (2).
- When using pressure tester KDJE-P100, the  
valve screw must be turned shut, when  
using KDEP 1034, only the screw at the  
right.

Make certain connections do not leak.

Yes

Continued on F5/F6



**F3**

Fuel pressure test  
Volvo 240



**F4**

Fuel pressure test  
Volvo 240

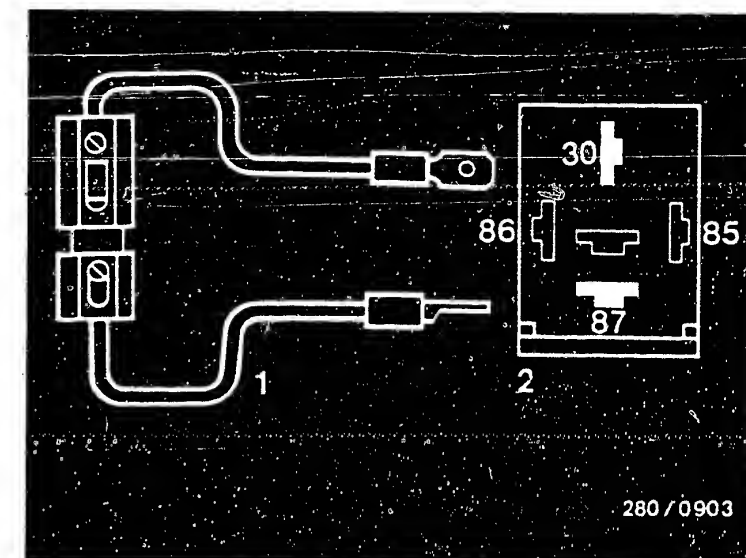




## Fuel pressure test (continued)

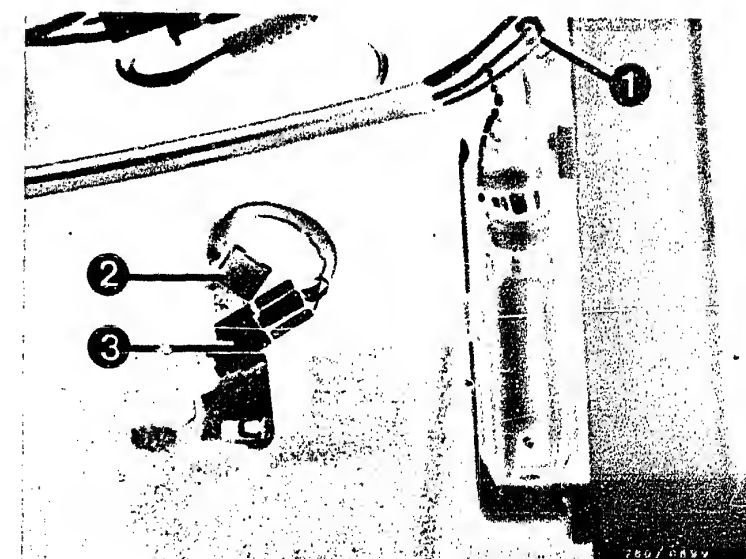
Yes

- Jumping the safety circuit
  - Remove the footwell panel on the front passenger's side.
  - Disconnect the pump relay and put in a jumper cable between Term. 30 and Term. 87.
  - Switch ignition "ON". Read fuel pressure on the pressure gauge.
- Fuel pressure:  
Test specification: 2.3...2.7 bar
  - Switch ignition off. Remove jumper cable and put pump relay back in.
- Start engine and allow to run.  
The fuel pressure drops back to approx. 2.0 bar (depending on the intake manifold pressure).  
If not, trouble-shoot the pressure regulator.



- 1 = Jumper cable  
Fuse holder and 10 A fuse (user-fabricated)
- 2 = Top view of connection socket

2 = Pump relay



Is the fuel pressure OK?  
Is the pressure regulator OK?  
Test specification:  
2.3...2.7 bar  
Is this test specification being met?

No

- Check the pressure regulator.  
Start the engine and have it run.  
Test specification for fuel pressure:  
approx. 2.0 bar  
Disconnect the vacuum hose from the pressure regulator.  
Test specification for fuel pressure:  
2.3...2.7 bar

Yes

Continued on F9/F10

Continued on F7/F8

**F5**

Fuel pressure test  
Volvo 240



**F6**

Fuel pressure test  
Volvo 240





## Fuel pressure test (continued)

Yes

Continued on F9/F10

Fuel pressure drops below 2.3 bar:

- Slowly pinch off the fuel return line.

Caution: Do not load pressure gauge beyond 6 bar!

If the pressure rises above 4 bar, take out and replace the pressure regulator. The pressure regulator is fastened to the fuel distribution pipe by piping.

- The fuel delivery line, the fuel filter are clogged.
- The filter in the tank is clogged.
- Corrosion in the tank.
- The pre-supply pump is not running.

Check by listening:

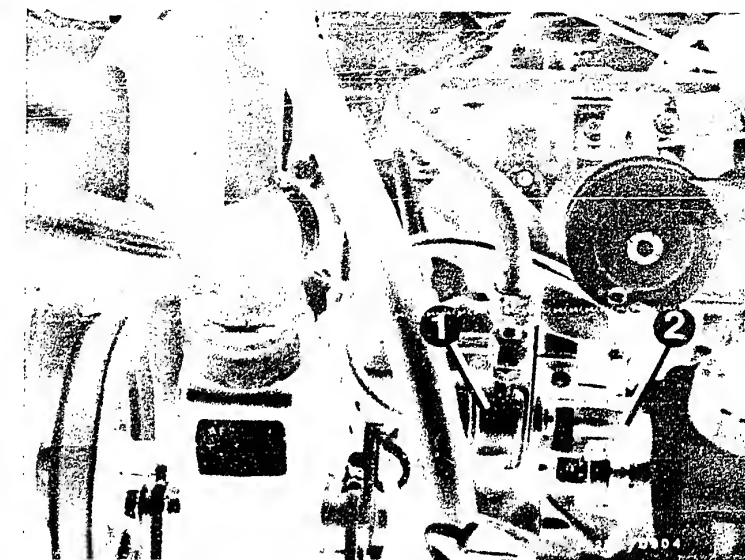
Disconnect connecting plug at the electric fuel pump. Jump the safety circuit.

- Remove the footwell panel on the front passenger's side.
- Disconnect the pump relay and insert a jumper cable between Term. 30 and Term. 87. Switch the ignition "ON".
- The pre-supply pump must run.

Testing: Remove the hose from the intake fitting on the electric fuel pump and hold it into a measuring graduate. Compare the amount of fuel flowing out. With the pre-supply pump, there must be more fuel delivered than without it. If not, check the connecting lead fuse No. 5, and if need be, take out and replace the pre-supply pump.

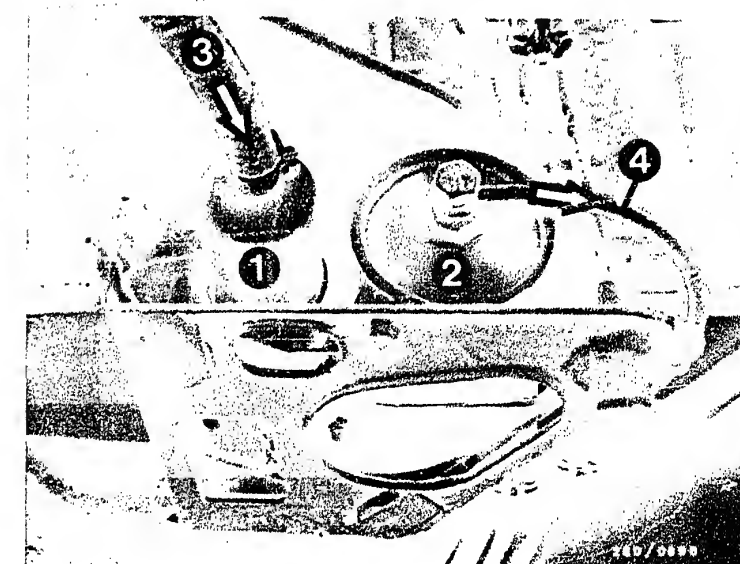
Fuel pressure exceeds 2.7 bar:

- The fuel return line is clogged or crimped off.
- Take out and replace the pressure regulator.



1 = Pressure regulator  
2 = Fuel return line

1 = Electric fuel pump  
2 = Fuel filter  
3 = Fuel suction line  
4 = Fuel delivery line



**F7**

Fuel pressure test  
Volvo 240



**F8**

Fuel pressure test  
Volvo 240



## Fuel pressure test (continued)

Does the fuel pressure remain almost constant after the engine is switched off?

Test specification:  
2.3...2.7 bar

Is the test specification being met?

Yes

Take out pressure gauge. Restore the connection between the fuel line and the fuel distribution pipe. Remove the jumper cable and plug in the pump relay into the connecting socket. The fuel pressure test has been completed. If the defect has not been located or if additional instructions are needed for correction of the defect, continue in accordance with the trouble-shooting chart that you have selected.

- Detailed trouble-shooting chart (Coordinates C2...C4)
- Targeted trouble-shooting chart (Coordinates C5...C8)

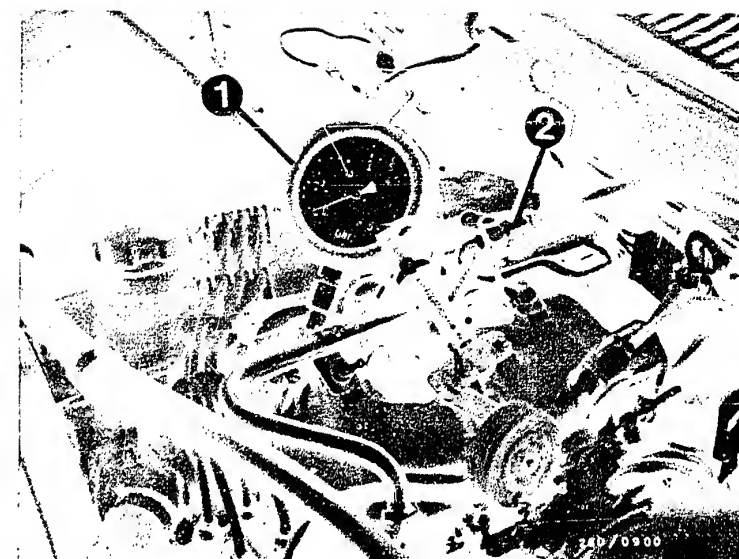
No

The fuel pressure decreases quickly after hot engine is shut off.

- Check the fuel system for leaks (build up the fuel pressure):  
Fuel pressure 2.3...2.7 bar  
Disconnect the jumper cable and watch the pressure gauge.  
After approx. 20 min, the fuel pressure must still be min. 1.0 bar.

If not: -

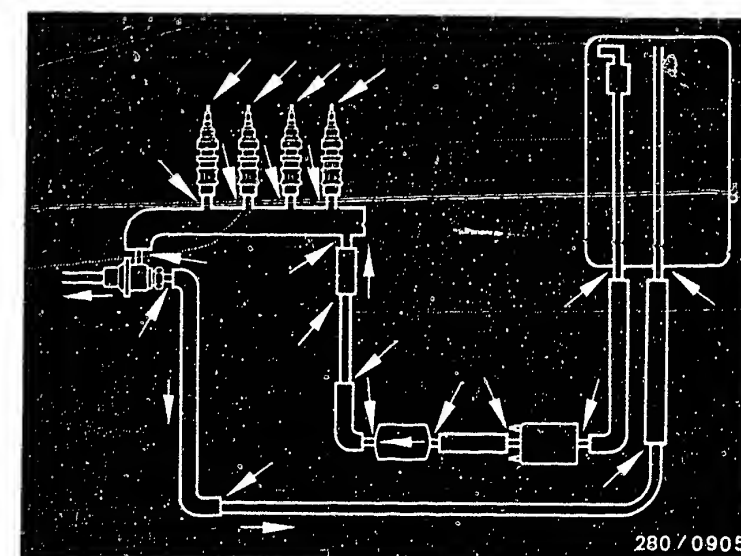
- Check connections between the components and fuse hoses and lines for leaks.
- Pressure regulator (diaphragm)
- Solenoid-operated fuel injection valves (needle seat, valve is not closing properly.)
- Electric fuel pump (non-return valve leaking). Use set of parts 1 587 010 007.
- Fuel filter is leaking.



1 = Pressure gauge

### Fuel line diagram

Arrows indicate connections between hoses and components.



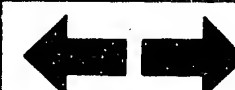
F9

Fuel pressure test  
Volvo 240



F10

Fuel pressure test  
Volvo 240



## STARTING MOTOR TURNS, ENGINE DOES NOT START OR STARTS ONLY WITH DIFFICULTY

### Trouble-shooting program according to customer complaint

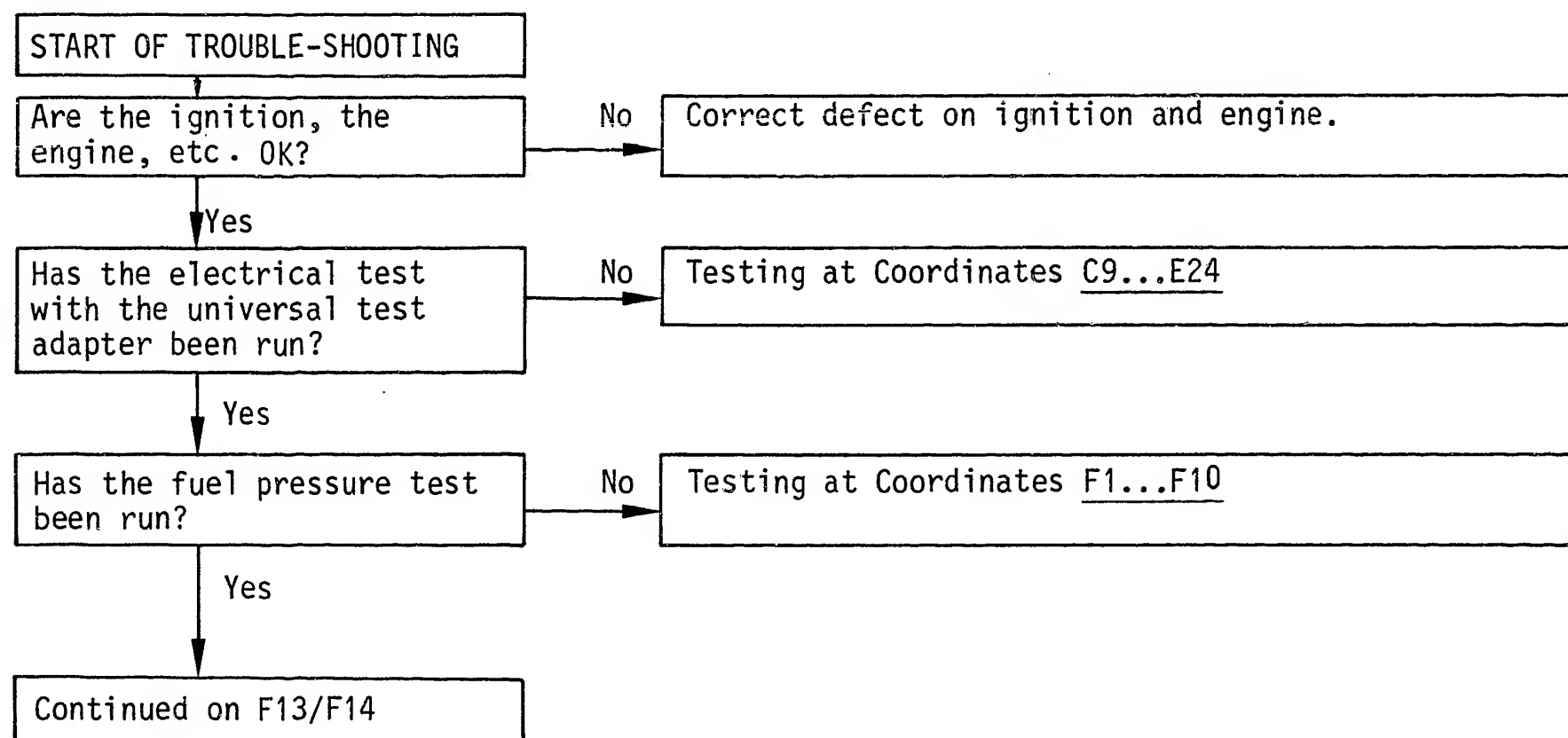
#### How to use the chart

The testing has been organized into 3 columns of boxes:

- The column at the left contains the questions for the tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



**F11**

Engine does not start

Volvo 240



**F12**

Engine does not start

Volvo 240



Starting motor turns; engine does not start or starts only with difficulty (continued)

Yes

Is the start-control OK?  
(Control unit operation)

- Connect test lead between one solenoid-operated injection valve.

- Remove plug from temperature sensor II (engine). (White plug)

- Connect motortester or multimeter to test lead. (Setting V, scale 10 V)

- Jump the safety circuit. (Power supply for the control unit):

Disconnect connecting plug for the other solenoid-operated fuel-injection valves.

- Start the engine.

Does the voltage on the solenoid-operated fuel-injection valve drop off during start from approx. 6 V to approx. 0.5 V? (With the engine at normal operating temperature, and the NTC II plug plugged in, the value for voltage is less than 0.5 V.)

After testing, restore the original condition of installation.

Yes

Continued on F19/F20

No

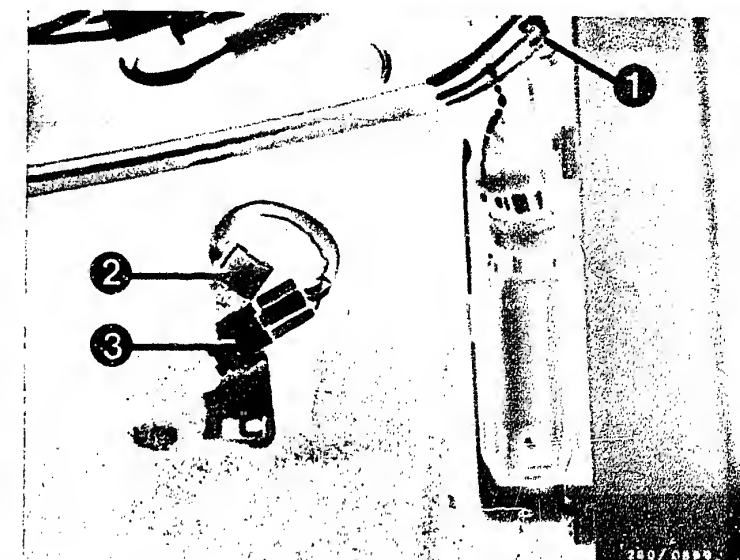
Functional test:

- Disconnect the main relay.

- Jump the safety circuit

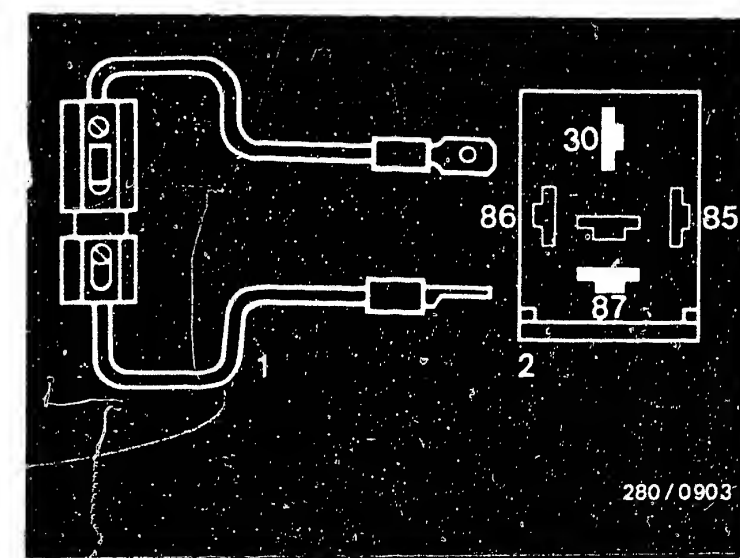
Insert a jumper cable between Term. 30 and Term. 87 in the connecting socket. (Power supply for the control unit and for the solenoid-operated fuel-injection valves).

Continued on F15/F16



3 = Main relay

1 = Jumper cable  
Fuse holder and 10 A fuse  
(user-fabricated)  
2 = Top view of connection  
socket



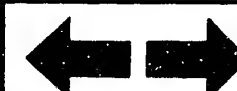
**F13**

Engine does not start  
Volvo 240



**F14**

Engine does not start  
Volvo 240

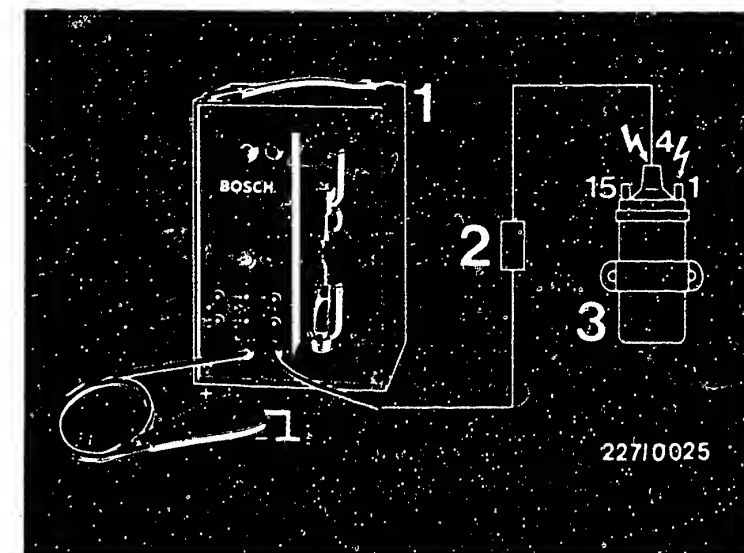


Starting motor turns, engine does not start or starts only with difficulty (continued)

- Disconnect the ignition lead Term. 4 from the ignition distributor cap and ground it using a spark gap. (Caution! The engine must not turn over).

Caution:

When using a spark gap, in order to prevent destruction of the trigger box, a suppression resistor of min. 2 k $\Omega$  must be connected up between the spark gap and the ignition coil Term. 4. For example, (5 k $\Omega$ ) sleeve-type suppressor 0 356 500 001.



1 = Spark gap  
2 = Sleeve-type suppressor, 5 k $\Omega$   
3 = Ignition coil (Caution!  
Dangerous voltages, 400 V - 25 kV  
at Term. 1 and Term. 4)

Yes

Continued on F19/F20

Continued on F17/F18

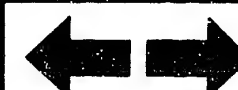
**F15**

Engine does not start  
Volvo 240



**F16**

Engine does not start  
Volvo 240



Starting motor turns, engine does not start or starts only with difficulty (continued)

- Connect 2-pole adapter lead 1 684 463 093 between one solenoid-operated fuel-injection valve and its electrical connection lead.
- Connect multimeter to the free measurement terminal. Scale approx. 10 V.
- Take out pump fuses No. 5, 7.
- Disconnect lead plug from the temperature sensor II (engine) (white plug)
- Disconnect connection plug for the solenoid-operated fuel-injection valves.

Measurement:

- Start the engine.
- Reading for voltage drops from an initial approx. 6 V to approx. 2.0 V within approx. 10 sec. starting time.

If the values for voltage are not attained, take out and replace the control unit.

- Voltage test may not be repeated until after approx. 1 min.

- Plug the lead plug onto the temperature sensor. When the engine is at normal operating temperature, start it. Reading for voltage is less than 0.5 V.

If not, take out and replace temperature sensor II.

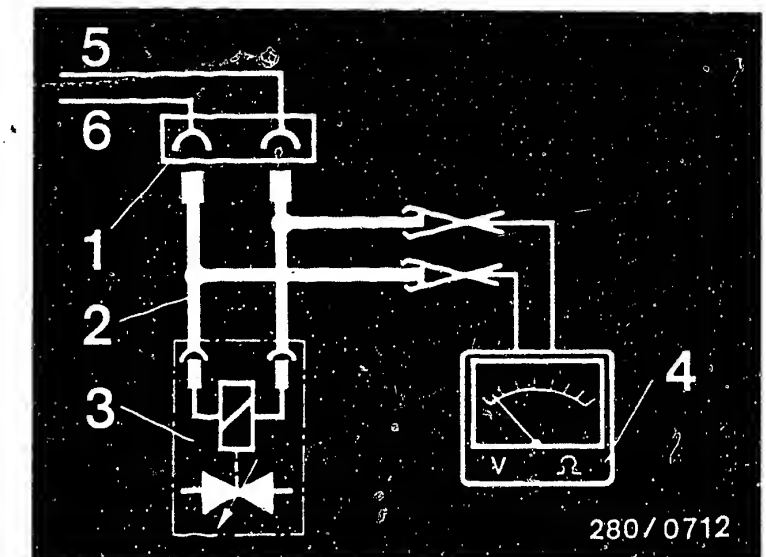
Caution!

Do not repeat the test too often if the solenoid-operated fuel-injection valve is defective (does not close correctly). The engine can run to full speed.

N.B.!

After the test, restore the original condition of installation.

Yes



1 = Connection plug for the solenoid-operated fuel-injection valve lead

2 = Test lead 1 684 463 093

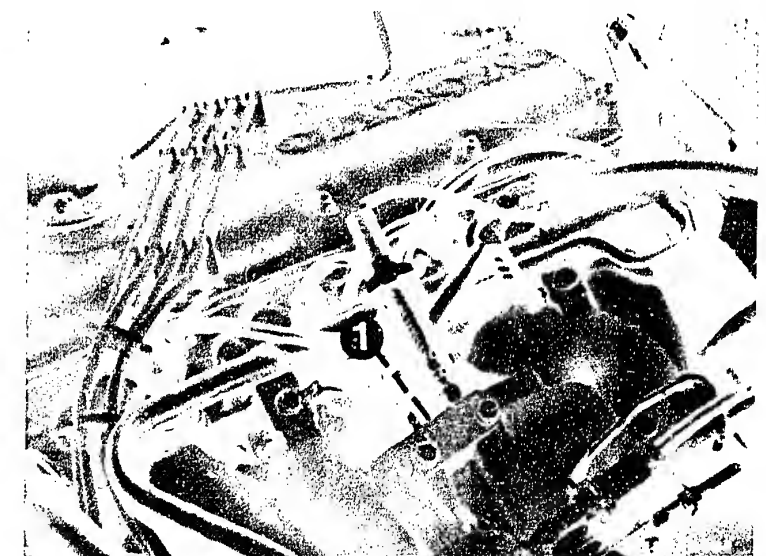
3 = Solenoid-operated fuel-injection valve

4 = Multimeter or motortester

5 = From pump relay Term. 87

6 = From control unit Term. 13

1 = Temperature sensor II, (engine) on the engine block



Continued on F19/F20

**F17**

Engine does not start  
Volvo 240



**F18**

Engine does not start  
Volvo 240





Starting motor turns, engine does not start or starts only with difficulty (continued)

Yes

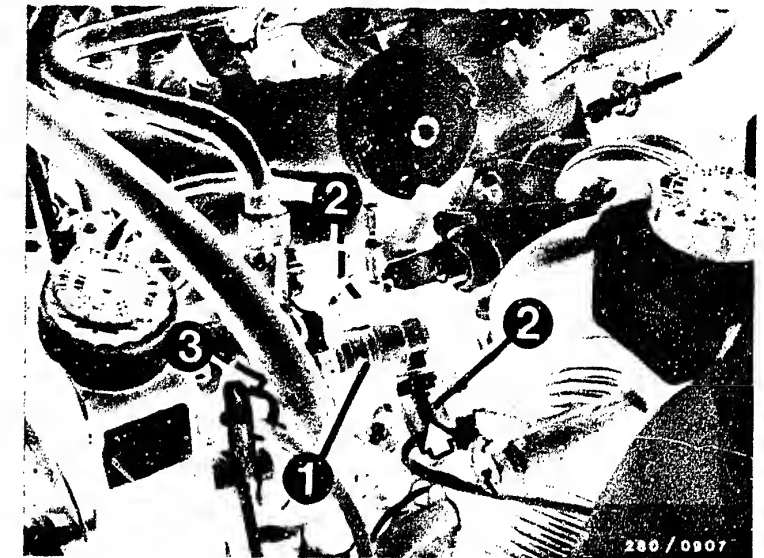
Is the idle actuator OK mechanically?

No

- The idle actuator is tested electrically and functionally using the universal test adapter.
- Mechanical test  
The idle actuator is tested for ease of movement as follows:
  - Take the idle actuator out. (Disconnect hoses.)
  - Disconnect the plug.
  - Join the center connection (Term. 4) to battery voltage.
  - Connect the outer connection (Term. 3) to ground.
  - By visual inspection, find out whether or not the rotary slider turns to the end stop.
  - Change the outer connection, i.e., connect Term. 5 to ground. The rotary slider must now turn to the opposite stop.If the idle actuator is defective, take it out and replace it.  
When installing the idle actuator, watch the direction of flow through it (arrow).

Yes

Continued on F21/F22



1 = Idle actuator  
2 = Connection hoses  
3 = Connection plug  
Arrow = Direction of throughflow

**F19**

Engine does not start  
Volvo 240



**F20**

Engine does not start  
Volvo 240



Starting motor turns, engine does not start or starts only with difficulty (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?

Between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

No

Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

Testing:

• Visual inspection:

- Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
- Is the wire screen on both sides OK?
- Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

• Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term. 6 and Term. 3:

0...1100  $\Omega$

Between Term. 5 and Term. 3:

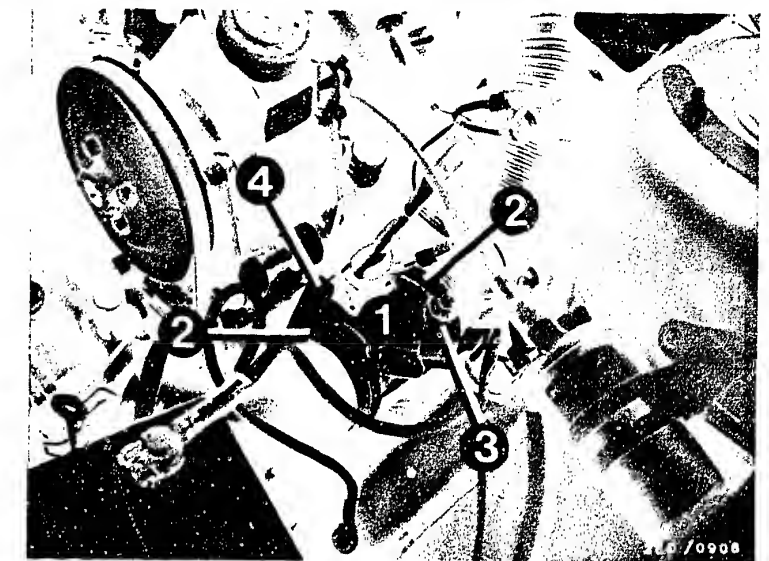
3.6...4.1  $\Omega$

If there are deviations, take out and replace the hot-wire air-mass sensor.

Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak - unmetered air!)

Yes



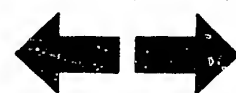
- 1 = Hot-wire air-mass sensor
- 2 = Hose clamps
- 3 = Bracket
- 4 = Potentiometer for idle-mixture-adjustment

Continued on F23/F24

**F21**

Engine does not start

Volvo 240



**F22**

Engine does not start

Volvo 240



Starting motor turns, engine does not start or starts only with difficulty (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

Yes

Checking of the customer complaint

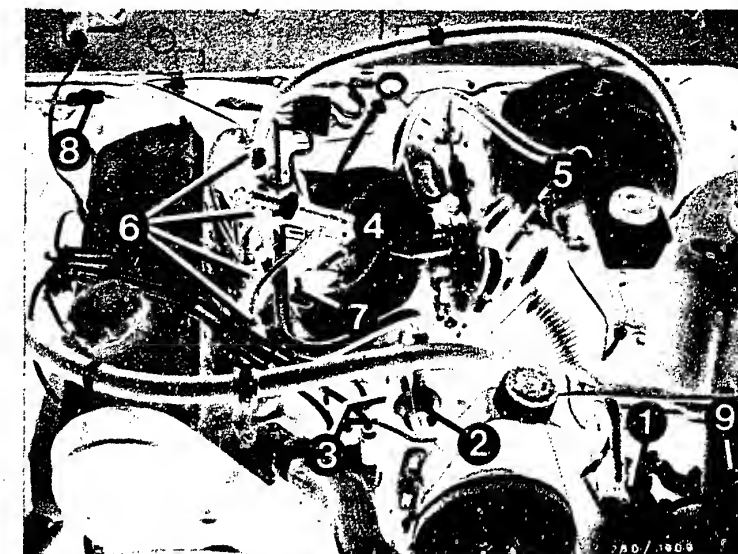
"Starting motor turns, engine does not start or starts only with difficulty,"

has been completed.  
Has the customer complaint been corrected?

No

Other possible defects:

- o The customer complaint has been incorrectly identified. (See Coordinates C3...C8). If the defect has not been identified using the "targeted trouble-shooting" see the "detailed trouble-shooting" (Coordinates C3/C4).
- o The engine is not OK mechanically. (Compression, valve setting, valve timing, wear on camshaft).



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection

**F23**

Engine does not start  
Volvo 240



**F24**

Engine does not start  
Volvo 240



## ENGINE STARTS AND THEN DIES

### Trouble-shooting program according to customer complaint

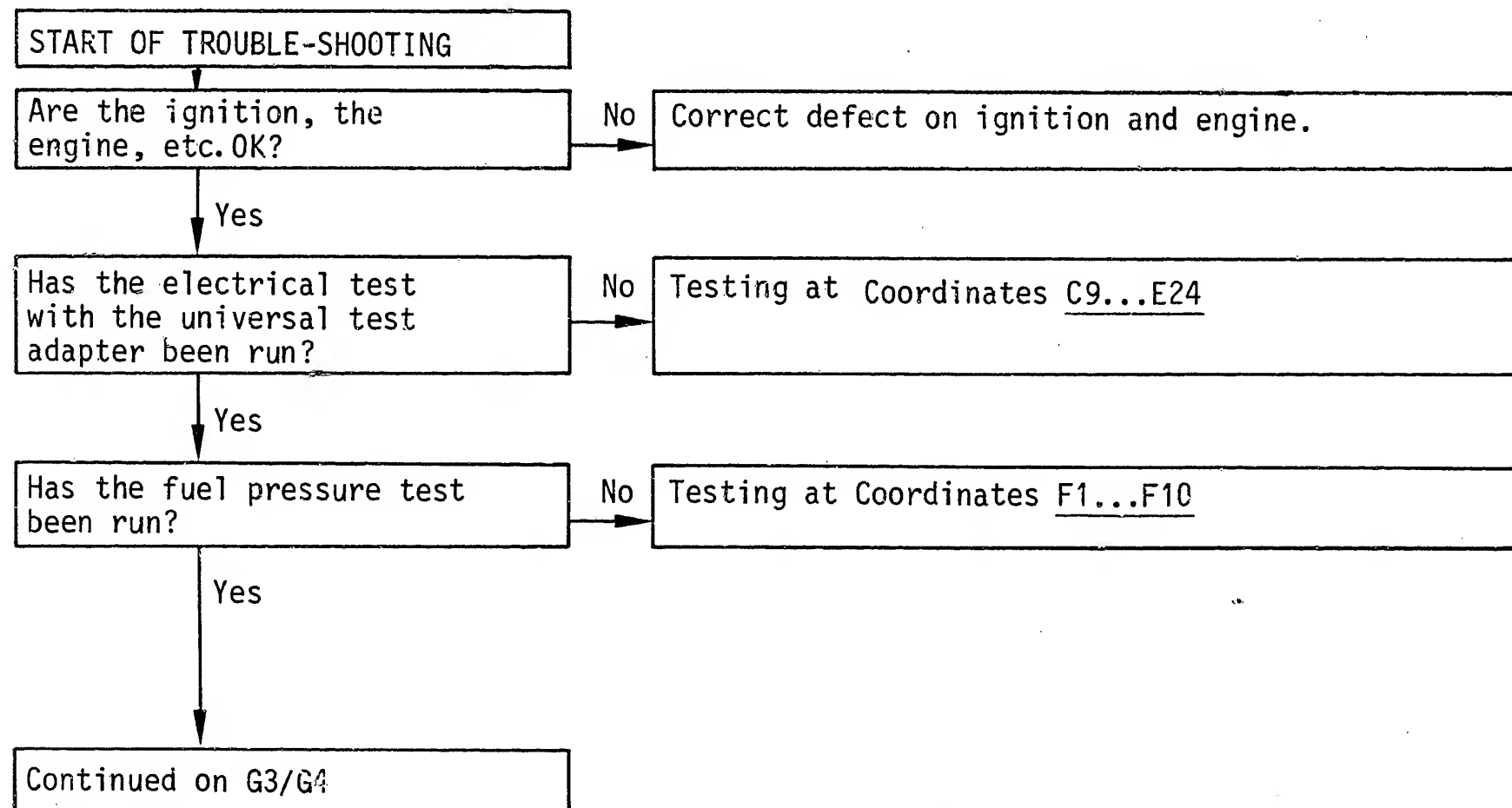
#### How to use the chart

The testing has been organized into 3 columns of boxes:

- The column at the left contains the questions for tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



**G1**

Engine starts and then dies  
Volvo 240



**G2**

Engine starts and then dies  
Volvo 240



Engine starts and then dies (continued)

Yes

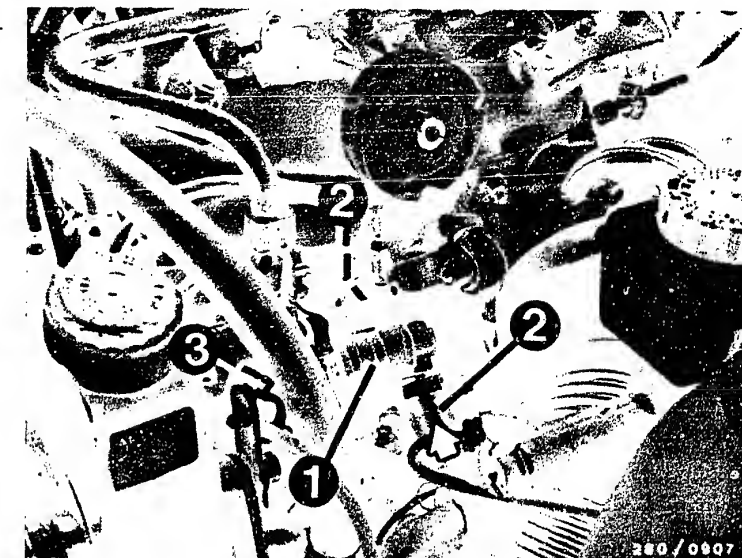
Is the idle actuator OK mechanically?

No

- The idle actuator is tested electrically and functionally using the universal test adapter.
- Mechanical test  
The idle actuator is tested for ease of movement as follows:
  - Take the idle actuator out. (Disconnect hoses.)
  - Disconnect the plug.
  - Join the center connection (Term. 4) to battery voltage.
  - Connect the outer connection (Term. 3) to ground.
  - By visual inspection, find out whether or not the rotary slider turns to the end stop.
  - Change the outer connection, i.e., connect Term. 5 to ground. The rotary slider must now turn to the opposite stop.If the idle actuator is defective, take it out and replace it.  
When installing the idle actuator, watch the direction of flow through it (arrow)

Yes

Continued on G5/G6



1 = Idle actuator  
2 = Connection hoses  
3 = Connection plug  
Arrow = Direction of through flow

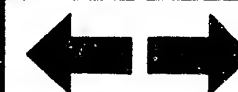
**G3**

Engine starts and then dies  
Volvo 240



**G4**

Engine starts and then dies  
Volvo 240



Engine starts and then dies (continued)

Are the solenoid-operated fuel-injection valves OK with respect to leakage?

No

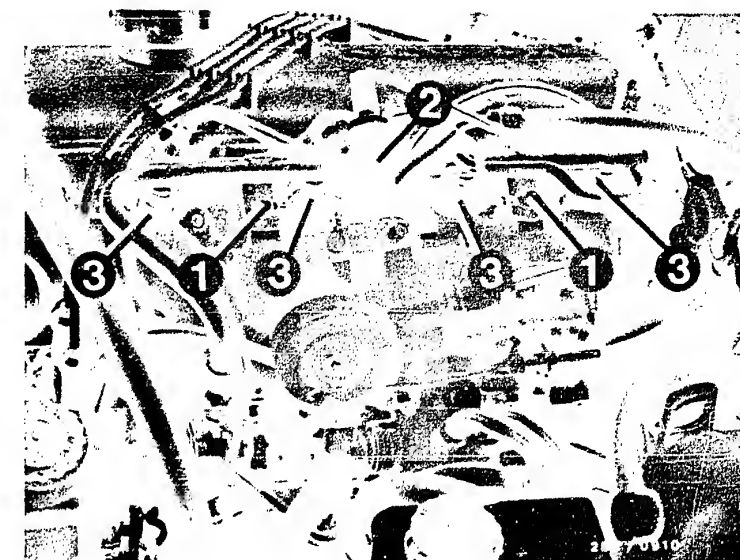
Checking the solenoid-operated fuel-injection valves for leaks

- Take out the fuel distribution pipe and the solenoid-operated fuel-injection valves:
  - Disconnect the hose.
  - Release the fastening screws on the fuel distribution pipe and the pressure regulator.
  - Pull all 4 solenoid-operated fuel-injection valves out of the cylinder head simultaneously, and carefully.
- Build up the fuel pressure:  
Jump the safety circuit. The electric fuel pump must run.  
Caution:  
Make certain no fuel gets on hot portions of the engine.
- Test specification:  
No drop may drip from the opening of the solenoid-operated fuel-injection valve within 60 seconds. If there is a defect, take out and replace the solenoid-operated fuel-injection valve.
- Removal:
  - Disconnect the electrical connection.
  - Carefully shove the holding clamp out of the slot.
  - Carefully pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe.

Yes

Continued on G9/G10

Continued on G7/G8



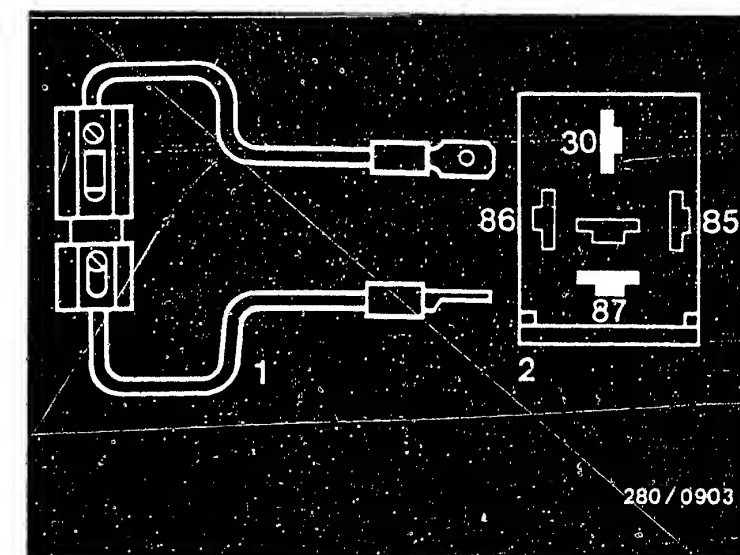
1 = Fastening screws

2 = Hose

3 = Solenoid-operated fuel-injection valves

1 = Jumper cable with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection socket



**G5**

Engine starts and then dies  
Volvo 240



**G6**

Engine starts and then dies  
Volvo 240





Engine starts and then dies (continued)

Yes

Caution: Catch fuel that escapes. Do not allow it to drip onto hot portions of the engine.

Caution!

Before the two O-rings are put in, they may be greased only lightly (silicone grease Ft 2 v 1). The other parts of the solenoid-operated fuel-injection valve must remain free of grease.

● Installation

- Carefully put new solenoid-operated fuel-injection valve onto the fuel distribution pipe.
- Shove the holding bracket into the slot until it catches. (Check the connection for leaks.)

Caution!

After testing, restore the original condition of installation. (Put in the hose.) Check for leaks (unmetered air).

Continued on G9/G10

**G7**

Engine starts and then dies  
Volvo 240



**G8**

Engine starts and then dies  
Volvo 240



Engine starts and then dies (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?

Between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

No

Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

Testing:

• Visual inspection:

- Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
- Is the wire screen on both sides OK?
- Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

• Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term. 6 and Term. 3:

0...1100  $\Omega$

Between Term. 5 and Term. 3:

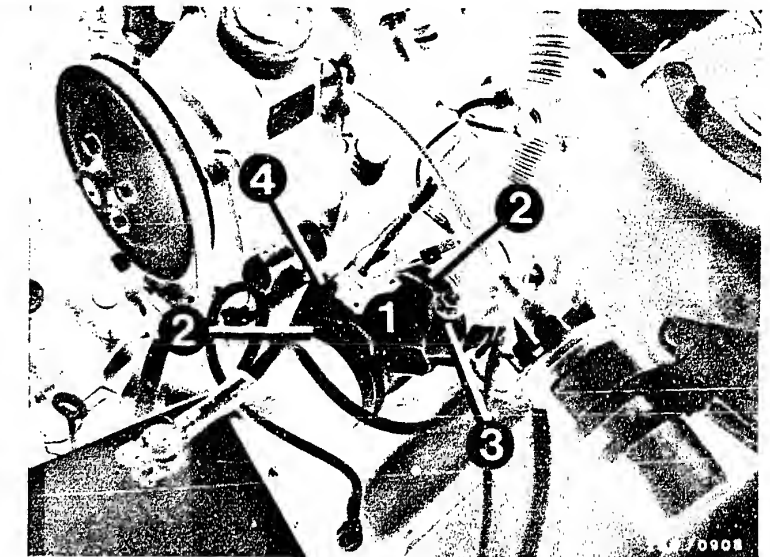
3.6...4.1  $\Omega$

If there are deviations, take out and replace the hot-wire air-mass sensor.

Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak - unmetered air!)

Yes

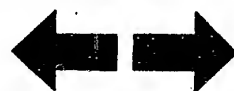


- 1 = Hot-wire air-mass sensor  
2 = Hose clamps  
3 = Bracket  
4 = Potentiometer for idle-mixture adjustment

Continued on G11/G12

**G9**

Engine starts but then dies  
Volvo 240



**G10**

Engine starts but then dies  
Volvo 240



# Engine starts and then dies (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

## Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

## Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

Yes

Checking of the customer complaint

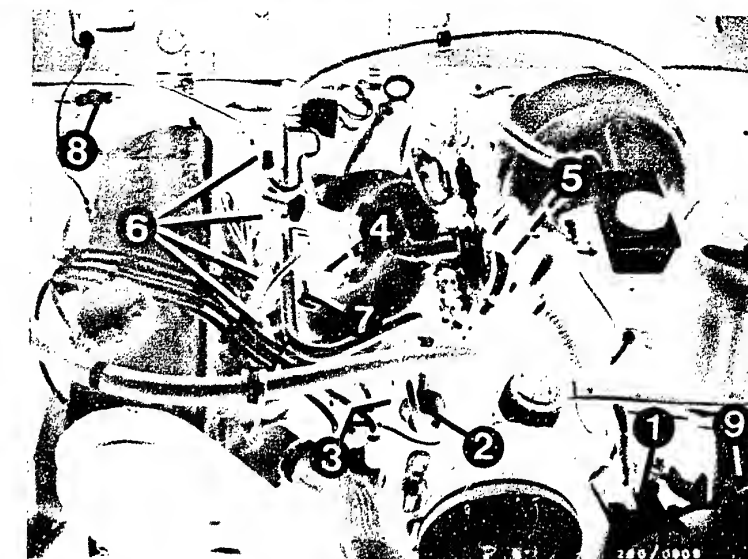
"Engine starts and then dies,"

has been completed.  
Has the customer complaint been corrected?

No

## Other possible defects:

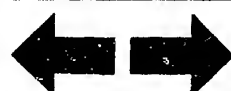
- The customer complaint has been incorrectly identified. (See Coordinates C3...C8). If the defect has not been identified using the "targeted trouble-shooting" see the "detailed trouble-shooting" (Coordinates C3/C4).
- The engine is not OK mechanically. (Compression, valve setting, valve timing, wear on camshaft).



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection

**G11**

Engine starts and then dies  
Volvo 240



**G12**

Engine starts and then dies  
Volvo 240



## ROUGH IDLE; INCORRECT IDLE SPEED

Trouble-shooting program according to customer complaint

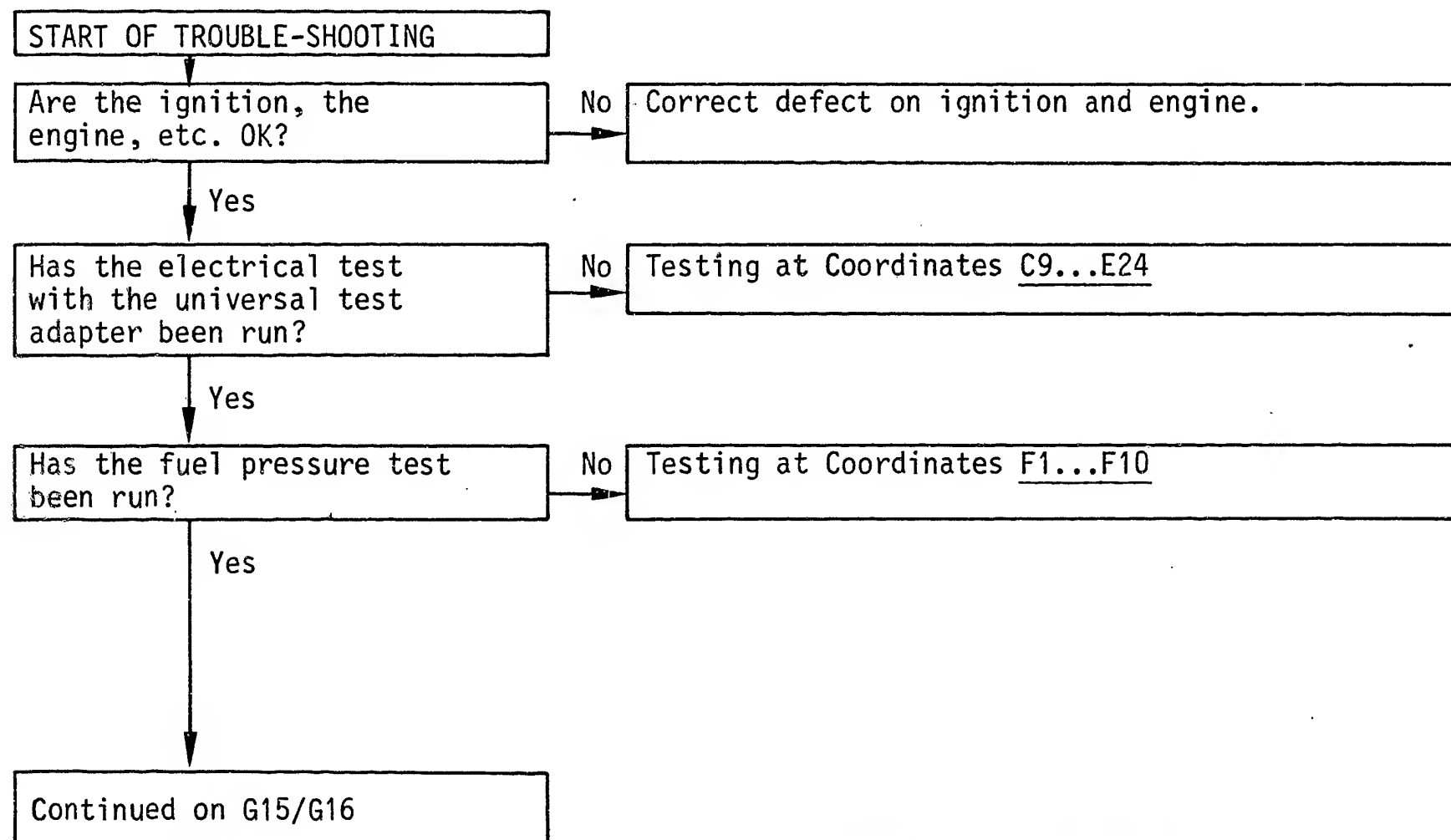
How to use the chart

The testing has been organized into 3 columns of boxes:

- The column at the left contains the questions for tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



**G13**

Rough idle  
Volvo 240



**G14**

Rough idle  
Volvo 240



# Rough idle, incorrect idle speed (continued)

Yes

Is the throttle valve closed?

- Does the throttle valve lever strike against the stop screw?

No

## • Testing:

Find out whether it is possible to close the throttle valve even further, causing the engine speed to drop off.

## • Adjustment of the throttle valve:

- Disconnect the accelerator linkage from the throttle valve.
- Release the throttle-valve switch.
- Release the throttle-valve stop screw and turn it back until it moves away from the stop. After that, turn it back forward until it touches the stop and continue turning 1/4 turn further. Secure the screw.

Yes

Is the throttle-valve switch correctly set?

- Does the idle contact close?
- Does the microswitch click audibly?
- Is the accelerator cable free of tension?
- Is the accelerator cable free of kinking?

No

## • Adjustment of the throttle-valve switch

Connect an ohmmeter to the throttle-valve switch between Term. 2 and Term. 18. Turn the throttle-valve switch to the left until the idle contact closes. (The microswitch clicks audibly.) Reading 0  $\Omega$ .

## • Checking the adjustment:

Pull on the accelerator cable somewhat. The idle contact opens. (The microswitch clicks audibly.) Reading  $\infty\Omega$ .

Fasten the throttle-valve switch again.

## • Check the accelerator-cable roller for ease of movement.

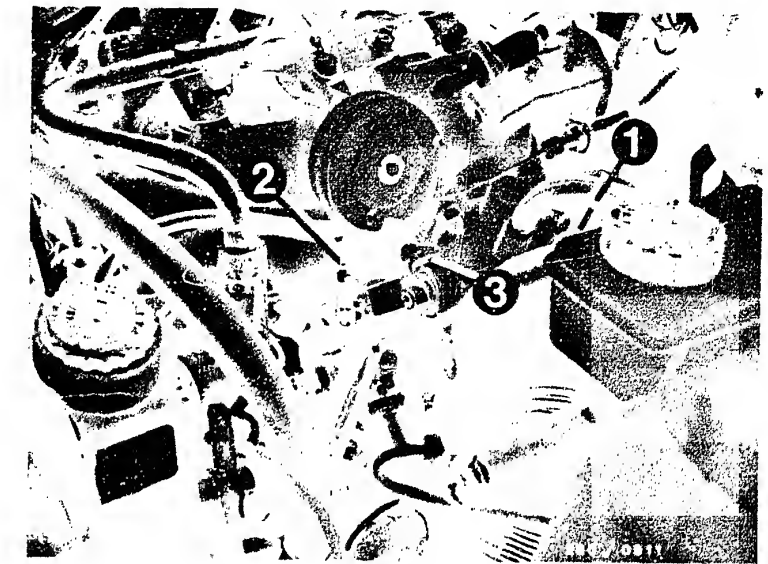
The roller should touch up against the idle stop. (Max. clearance between the accelerator roller and the idle stop 1 mm).

In the vehicle, step all the way down on the accelerator and check that the roller touches up against the full-load stop. If need be, adjust it.

- Test the kick-down cable (for vehicles with automatic transmissions). With the accelerator pedal all the way down, a dimension "A" of from 50.4...52.6 mm is to be attained. If need be, make an adjustment.

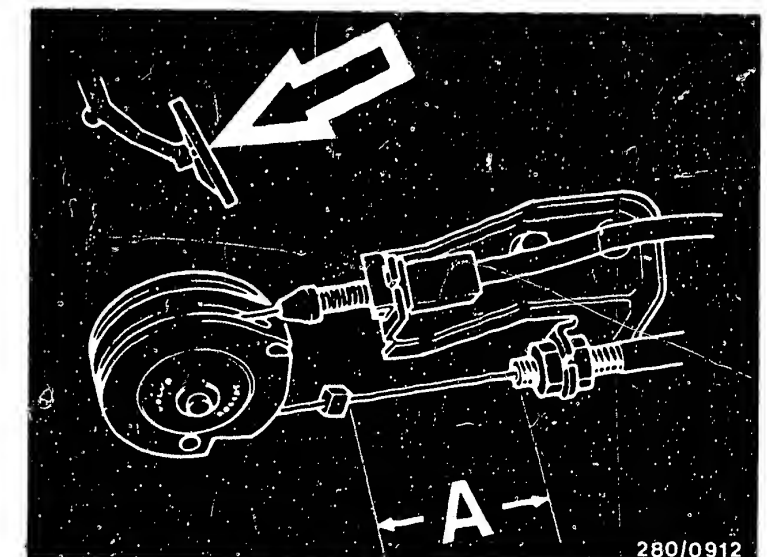
Yes

Continued on G17/G18



- 1 = Throttle-valve switch
- 2 = Accelerator linkage
- 3 = Throttle-valve stop screw

Kick-down adjustment  
(Vehicles with automatic transmissions)  
A=50.4...52.6 mm



280/0912

**G 15**

Rough idle  
Volvo 240



**G 16**

Rough idle  
Volvo 240



Rough idle, incorrect idle speed (continued)

Yes

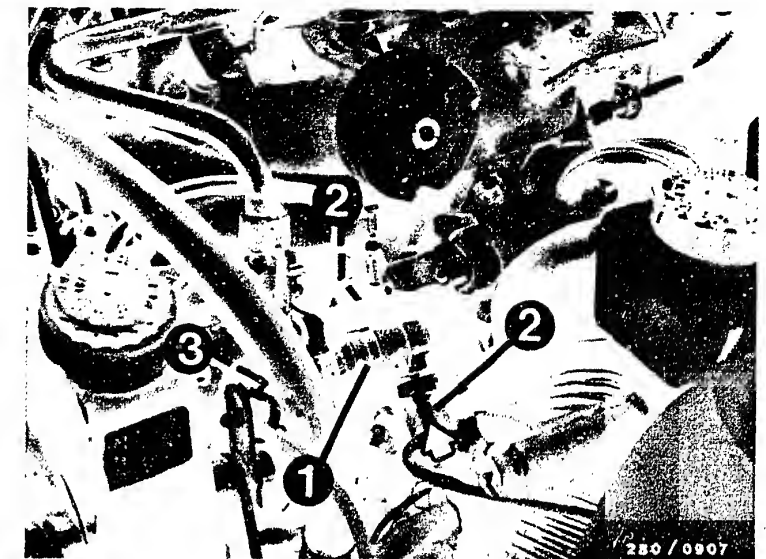
Is the idle actuator OK mechanically?

No

- The idle actuator is tested electrically and functionally using the universal test adapter.
- Mechanical test  
The idle actuator is tested for ease of movement as follows:
  - Take the idle actuator out. (Disconnect hoses.)
  - Disconnect the plug.
  - Join the center connection (Term. 4) to battery voltage.
  - Connect the outer connection (Term. 3) to ground.
  - By visual inspection, find out whether or not the rotary slider turns to the end stop.
  - Change the outer connection, i.e., connect Term. 5 to ground. The rotary slider must now turn to the opposite stop.If the idle actuator is defective, take it out and replace it.  
When installing the idle actuator, watch the direction of flow through it (arrow).

Yes

Continued on G19/G20



1 = Idle actuator  
2 = Connection hoses  
3 = Connection plug  
Arrow = Direction of throughflow

**G17**

Rough idle  
Volvo 240



**G18**

Rough idle  
Volvo 240





## Rough idle, incorrect idle speed (continued)

Yes

Have the solenoid-operated fuel-injection valves been checked functionally?

- Did the pattern shown at the right appear on the oscilloscope?
- No deviation, or missing, or interference detectable?

No

### Checking the solenoid-operated fuel-injection valves functionally.

- Connect the test lead as follows:  
The 2-pole plug connections on the test lead are connected between one solenoid-operated fuel-injection valve and its connecting lead. Of the two other connecting terminals on the test lead, only one connection clamp needs to be connected to the special input of the motortester.
- Caution!  
The unused connecting clamp must not come into contact with the vehicle ground!
- If correctly connected, the pattern shown at the right appears on the oscilloscope. Using the test lead, the fuel-injection pulses on the solenoid-operated fuel-injection valves can be checked with an ignition oscilloscope while the engine is running. If the pattern shown at the right is not obtained, or if deviations (interference, missing, etc.) can be seen, the other solenoid-operated fuel-injection valves should also be examined.
- If there is interference: Check how the leads have been laid.
- In case of missing: Eliminate loose contacts in the leads or in the plug connections.

Yes

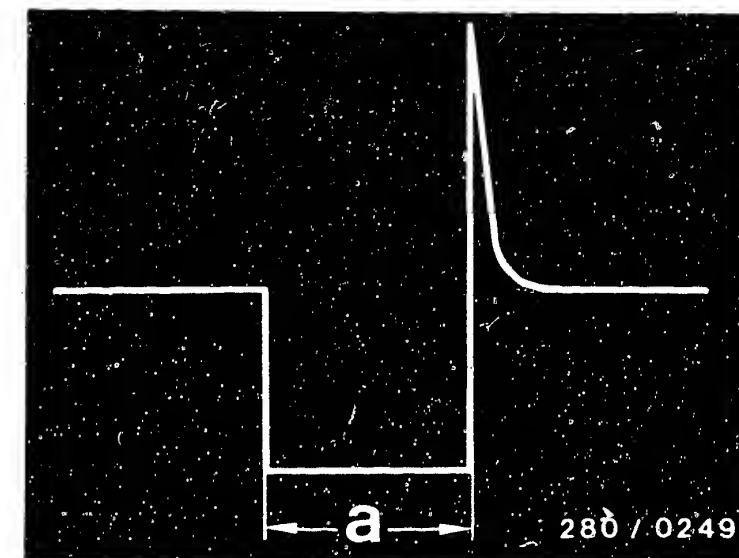
Is the solenoid-operated fuel-injection valve OK mechanically?

- Does the engine speed drop off when the inj. valve connectors are pulled off?
- Does a solenoid-operated fuel-injection valve need to be taken out and replaced?

No

- With the engine running, disconnect the solenoid-operated fuel-injection valve connectors from the solenoid-operated fuel-injection valves individually, one after the other. Then plug them back on. If the solenoid-operated fuel-injection valve is good, the engine speed must drop off.

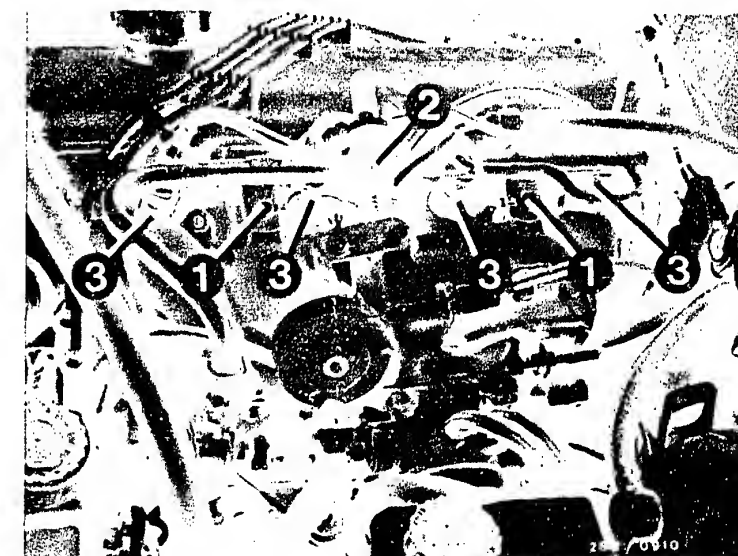
Continued on G21/G22



Injection pulse from a switched output stage (measured on the solenoid-operated fuel-injection valve)

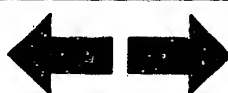
a = Pulse length (dependent on the engine load).

3 = Solenoid-operated fuel-injection valves



**G 19**

Rough idle  
Volvo 240



**G 20**

Rough idle  
Volvo 240



# Rough idle, incorrect idle speed (continued)

Yes

Are the solenoid-operated fuel-injection valves OK?

- Removal and installation

No

## Removal

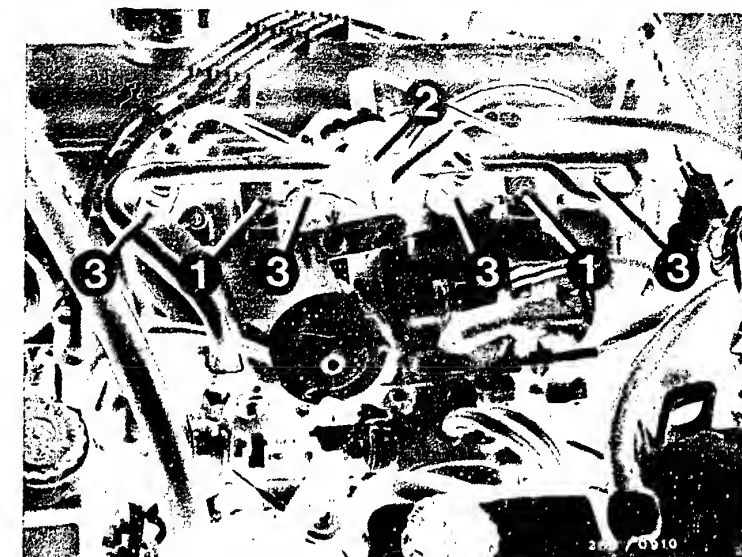
- Take out the fuel distribution pipe and the solenoid-operated fuel-injection valves.
- Take off the hose.
- Release the fastening screws on the fuel distribution pipe and on the pressure regulator.
- Pull all 4 fuel-injection valves out of the cylinder head simultaneously and carefully.
- Taking out and replacing the fuel-injection valve.
- Disconnect the electrical connection.
- Carefully push the holding clamp out of the slot.
- Carefully pull a defective fuel-injection valve out of the fuel distribution pipe. Caution! Catch any fuel that escapes! Do not allow it to drip on hot portions of the engine.
- N.B.! Before the two O-rings are put in, they may be greased only lightly (silicone grease Ft 2v1). The other parts of the fuel-injection valve must remain free of grease.

## Installation

- Carefully put the new fuel-injection valve on the fuel distribution pipe.
- Shove the holding clamp into the slot until it catches. (Check the connection for leaks.)
- Put on the electrical connection. (Good contact).
- Carefully insert all 4 fuel-injection valves simultaneously with the fuel distribution pipe into the intake manifold. Caution! Do not damage any O-rings or fuel-injection valve needles!
- Fasten the pressure regulator and the fuel distribution pipe with the screws. (Watch for leaks.) Make certain there is good contact with the ground terminals.
- Fasten the hose. After testing, or installation, the original installation condition must be restored. Check for leaks.

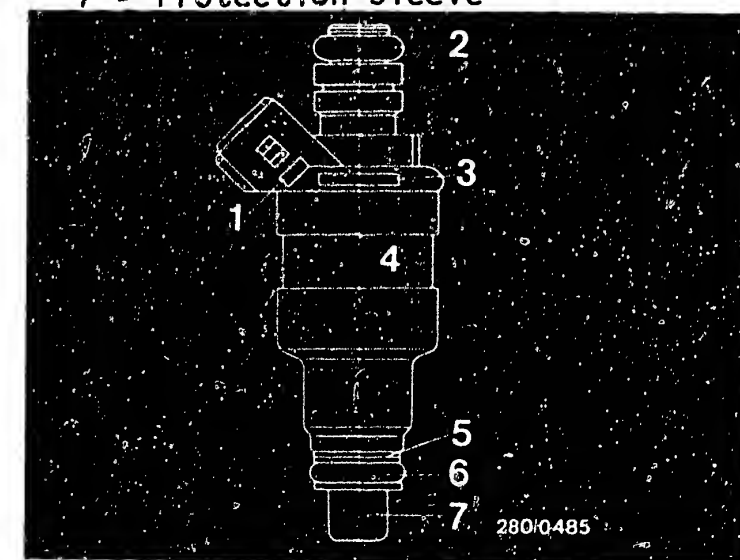
Yes

Continued on G23/G24



- 1 = Fastening screws
- 2 = Hose
- 3 = Solenoid-operated fuel-injection valves

- 1 = FD marking
- 2 = Top O-ring
- 3 = Part No.
- 4 = Solenoid-operated fuel-injection valve
- 5 = Supporting plate
- 6 = Bottom O-ring
- 7 = Protection sleeve



G21

Rough idle  
Volvo 240



G22

Rough idle  
Volvo 240



# Rough idle, incorrect idle speed (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

## Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

## Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

Yes

Checking of the customer complaint

"Rough idle, incorrect idle speed,"

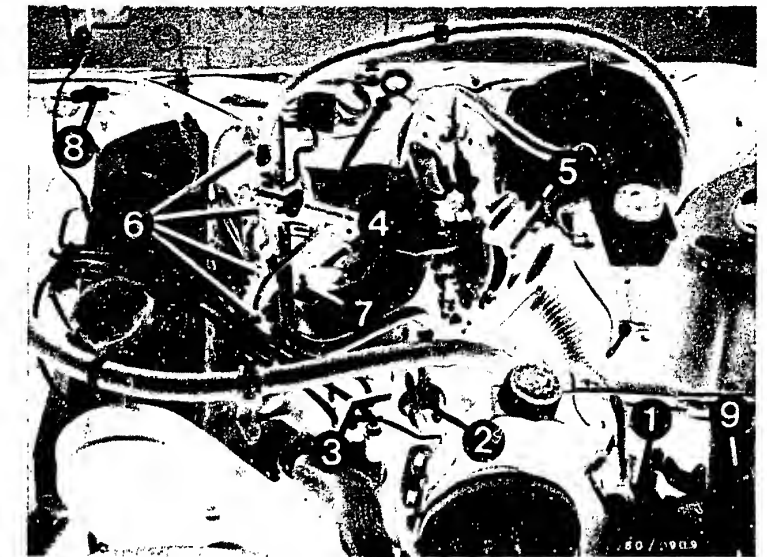
Further test instructions:

- Checking the lambda closed-loop control (Coordinates H1...H10)

No

## Other possible defects:

- The customer complaint has been incorrectly identified. (See Coordinates C3...C8). If the defect has not been identified using the "targeted trouble-shooting" see the "detailed trouble-shooting" (Coordinates C3/C4).
- The engine is not OK mechanically. (Compression, valve setting, valve timing, wear on camshaft).



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection



## LAMBDA CLOSED-LOOP CONTROL

### Checking and adjusting the CO-level in the exhaust gas by changing the integrator voltage in vehicles with lambda closed-loop control

#### Preparations for testing

- Engine must be at normal operating temperature.
- Prior to testing, the engine must be run for approx. 30 sec. at a speed of  $3000 \text{ min}^{-1}$ . The lambda sensor must be properly warmed up.
- If testing has not been completed after 5 min, the sensor must be reheated ( $3000 \text{ min}^{-1}$  for approx. 30 sec.).
- Connect the lambda closed-loop control tester KDJE-P 600 to the 2-pole plug connection (pink lead) using the test clip (4). (If need be, user-fabricate an intermediate adapter.)
- Set the lambda closed-loop control tester to the scale 12 V.
- Connect the lambda closed-loop control tester to positive (red clip) and negative (black clip) on the battery. The green LED must light up!

#### Prerequisites for checking the lambda closed-loop control are that

- the testing program with the universal test adapter has been run,
- the fuel pressure test has been run,
- the engine is at normal operating temperature,
- the lead from the activated carbon filter (if there is one) has been crimped off,
- the engine is running.

Idle speed: Test specification:

$730 \dots 770 \text{ min}^{-1}$

If the test specification is not within tolerance, ground the testing pin using a jumper cable. Make a good ground contact (2-pole plug connection, blue/white lead).

Basic engine speed Test specification:

$650 \dots 700 \text{ min}^{-1}$

(Set using the adjusting screw.)

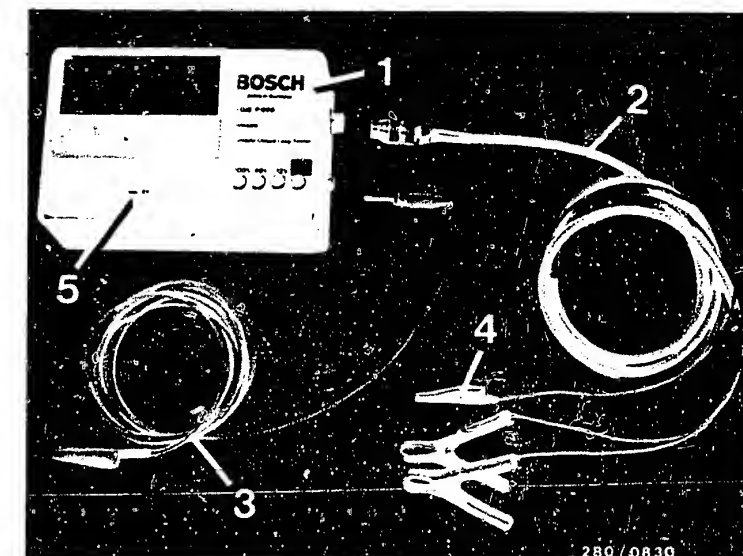
Remove jumper cable. Idle speed:

$730 \dots 770 \text{ min}^{-1}$

#### CO-adjustment (integrator voltage):

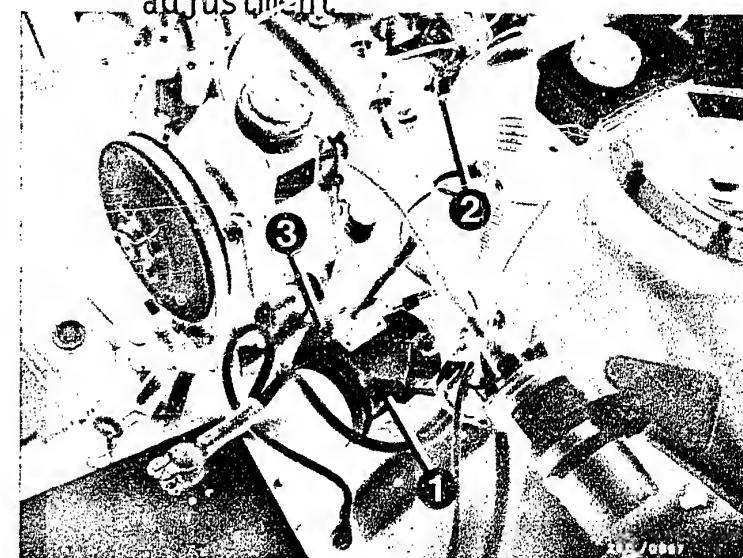
The CO-level in the exhaust gas is adjusted indirectly via the integrator voltage of the lambda closed-loop control.

In the adjustment on the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor, it is necessary to drill out the CO-anti-tamper device. (Use suitable commercially available tools.) After testing, it is absolutely necessary to put in a new seal (1 283 123 004). The adjustment must be made in small steps (socket hex screw, AF5). The reading for voltage must always be checked afterwards.



- 1 = Lambda closed-loop control tester KDJE-P600
- 2 = Connecting lead KDJE-P600/51
- 3 = Lead KDJE-P600/1
- 4 = Test clip on 2-pole plug connection (pink lead)

- 1 = 2-pole plug connection (pink lead → integrator output)
- 2 = Adjusting screw for basic engine speed
- 3 = Potentiometer for idle-mixture-adjustment



H1

Lambda closed-loop control

Volvo 240



H2

Lambda closed-loop control

Volvo 240





# Lambda closed-loop control (continued)

Adjustment of the idle integrator voltage.

Watch the reading on the lambda closed-loop tester (idle). The reading must fluctuate back and forth between two values. (Closed-loop control) Is it functioning properly?

Yes

Continued on H5/H6

No

Has the sensor been correctly warmed?

Run the engine at 3000 min<sup>-1</sup> for 30 sec. At idle, the value for voltage now fluctuates back and forth.

- If not, ignition "OFF". Is the sensor lead incorrectly plugged in at the coupling, are there contact resistances? Check and if need be repair. Does the value for idle voltage now fluctuate back and forth? If not, ignition "OFF". Take apart the sensor coupling. Check the following leads for continuity:
  - From the control unit plug Term. 20 to the ground terminal for the electronic system. Specified value  $\infty \Omega$ .
  - Ground the lead from the control unit Term. 20 to the connection. Specified value approx. 0  $\Omega$ .

If not, take out and replace the lead.

Caution! The sensor lead must be shielded.

It is not permissible to check the lambda sensor directly using a multimeter. The test current can destroy the lambda sensor! Re-join the sensor connection. Run the engine (3000 min<sup>-1</sup>, 30 sec.). Idle, does the value for voltage now fluctuate back and forth? If not, ignition "OFF". Check the following leads for continuity:

- From the control unit plug Term. 22 to the 2-pole plug connection (pink lead). Specified value approx. 0  $\Omega$ . If not, take out and replace the lead. Idle, does the value for voltage now fluctuate back and forth? If not,
  - lambda sensor is defective. When putting in a new sensor, use grease VS 140 16 Ft.
  - LH-control unit defective.



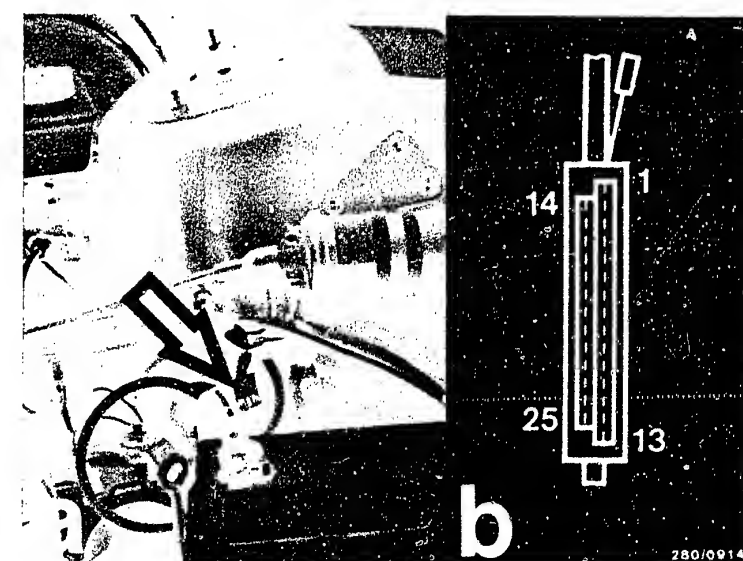
1 = Sensor connection  
2 = Lambda sensor

Fig. a

Arrow = 2-pole plug connection (pink lead, integrator output)

Fig. b

Top view of control unit plug



H3

Lambda closed-loop control  
Volvo 240



H4

Lambda closed-loop control  
Volvo 240



# Lambda closed-loop control (continued)

Yes

Take an average of the two extreme values for voltage (closed-loop control  $V_R$ ). Has the average been noted down?

Yes

Take apart the sensor connection. Take reading for voltage and note it down. (Open-loop control  $V_S$ ). Are the two readings for voltage equal ( $V_S = V_R$ )?

Yes

Adjustment of the idle integrator voltage completed.

Yes

The sensor lead must be plugged back together.

Yes

Continued on H7/H8

No

Is the intake system, including the hose to the pressure regulator, free of leaks? If need be, eliminate any defect. Is the exhaust system free of leaks? If need be, repair. Have no defects been found?

Adjustment of the integrator voltage and with that of the CO-level in the exhaust gas as well using the potentiometer idle-mixture-adjusting screw on the hot-wire air-mass sensor (with the sensor plugged in).

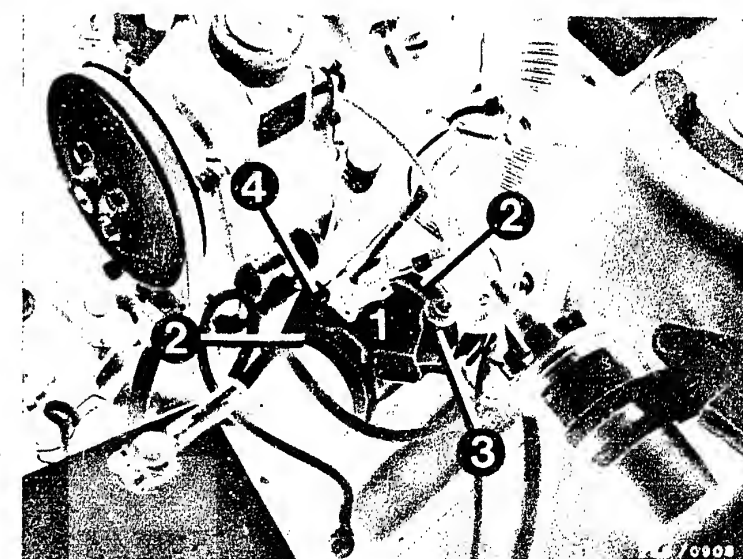
Note down the average value for voltage (closed-loop control  $V_R$ ). Take apart the sensor connection. (Disconnect the sensor.)

Take reading for voltage (open-loop control  $V_S$ ). The two values must be equal. If need be, repeat adjustment until the two readings for voltage are equal. Adjustment of the integrator voltage only with closed-loop control (with the sensor plugged in). If it cannot be adjusted, and the tests above have been carried through conscientiously, take out and replace the hot-wire air-mass sensor. If the integrator voltage still cannot be adjusted, take out and replace the LH-control unit.



1 = Sensor connection  
2 = Lambda sensor

4 = Potentiometer for idle-mixture-adjustment



H5

Lambda closed-loop control  
Volvo 240



H6

Lambda closed-loop control  
Volvo 240





# Lambda closed-loop control (continued)

Yes

Checking the "rich" value  
Run engine at idle. Engine at normal operating temperature.  
Take apart the sensor connection and ground the sensor lead (coming from the control unit).  
Does the reading for voltage rise to approx. 3 V (rich)?

No

Check the ground connection for the sensor lead. Eliminate contact resistances if there are any.  
If there are still defects, take out and replace the LH-control unit.

Yes

Checking the "lean" value  
Run the engine at idle. Engine at normal operating temperature.  
Connect the sensor lead (coming from the control unit) to the 2 V output on the lambda closed-loop control tester KDJE-P 600. (Lead KDJE-P 600/1).  
Does the reading for voltage drop to approx. 0.5 V (lean)?

No

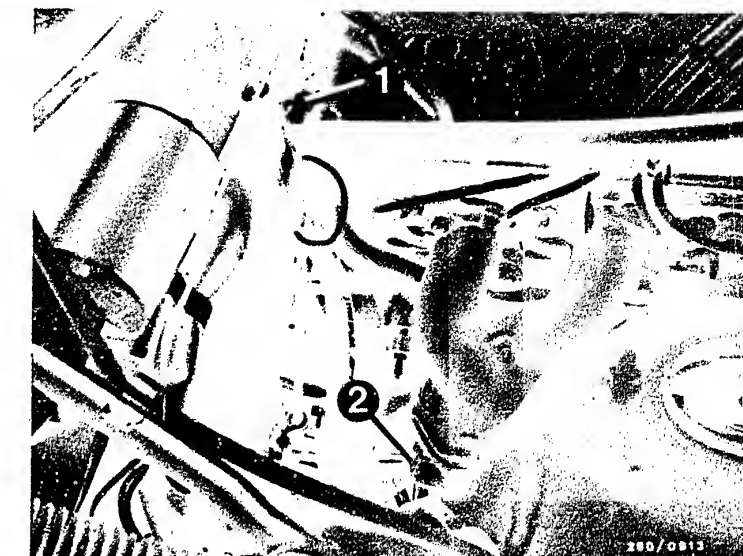
Check the 2 V voltage on the lambda closed-loop control tester.  
If there is voltage present, take out and replace the LH-control unit.  
If there is no voltage, the lambda closed-loop control tester is defective.

Yes

The sensor lead must be plugged back together

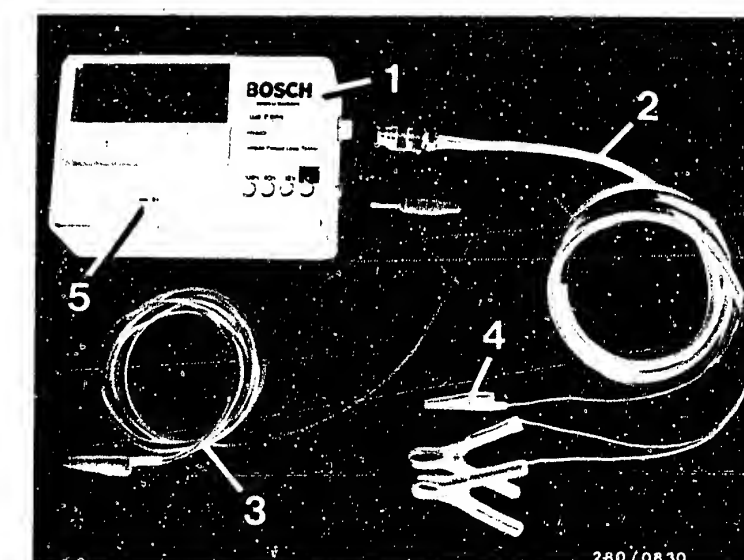
Yes

Continued on H9/H10



1 = Sensor connection  
2 = Lambda sensor

1 = Lambda closed-loop control tester KDJE-P 600  
2 = Connection lead KDJE-P 600/51  
3 = Lead KDJE-P 600/1  
4 = Test clip on 2-pole plug connection (pink lead)



H7

Lambda closed-loop control  
Volvo 240



H8

Lambda closed-loop control  
Volvo 240



## Lambda closed-loop control (continued)

Yes

Remove the lambda closed-loop control tester KDJE-P 600 and its connecting leads from the engine compartment. Restore all cable connections. Restore the original conditions of installation. After adjustment, put in a new CO anti-tamper device (seal) on the hot-wire air-mass sensor (Part No. 1 283 123 004). Testing of the lambda closed-loop control using the lambda closed-loop control tester KDJE-P 600 has been completed.

### Additional possible defects:

- The customer complaint has been incorrectly identified. (See Coordinates C3...C8.) If the defect has not been identified using the "targeted trouble-shooting" see "detailed trouble-shooting" (Coordinates C3/C4).
- The engine is not OK mechanically. (Compression, valve setting, valve timing, wear on camshaft).



1 = Sensor connection  
2 = Lambda sensor

**H9**

Lambda closed-loop control  
Volvo 240



**H10**

Lambda closed-loop control  
Volvo 240



## POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

How to use the chart

The testing has been organized into 3 columns of boxes:

- The column at the left contains the questions for tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.

START OF TROUBLE-SHOOTING

Are the ignition, the engine, etc. OK?

No

Correct defect on ignition and engine.

Yes

Has the electrical test with the universal test adapter been run?

No

Testing at Coordinates C9...E24

Yes

Has the fuel pressure test been run?

No

Testing at Coordinates F1...F10

Yes

Continued on H13/H14

**H11**

Poor throttle take-up

Volvo 240



**H12**

Poor throttle take-up

Volvo 240



# Poor throttle take-up (continued)

Yes

Is the throttle valve closed?

- Does the throttle valve lever strike against the stop screw?

No

## • Testing:

Find out whether it is possible to close the throttle valve even further, causing the engine speed to drop off.

## • Adjustment of the throttle valve:

- Disconnect the accelerator linkage from the throttle valve.
- Release the throttle-valve switch.
- Release the throttle-valve stop screw and turn it back until it moves away from the stop. After that, turn it back forward until it touches the stop and continue turning 1/4 turn further. Secure the screw.

Yes

Is the throttle-valve switch correctly set?

- Does the idle contact close?
- Does the microswitch click audibly?
- Is the accelerator cable free of tension?
- Is the accelerator cable free of kinking?

No

## • Adjustment of the throttle-valve switch

Connect an ohmmeter to the throttle-valve switch between Term. 2 and Term. 18. Turn the throttle-valve switch to the left until the idle contact closes. (The microswitch clicks audibly.) Reading 0  $\Omega$ .

## • Checking the adjustment:

Pull on the accelerator cable somewhat. The idle contact opens. (The microswitch clicks audibly.) Reading  $\infty\Omega$ .

Fasten the throttle-valve switch again.

## • Check the accelerator-cable roller for ease of movement.

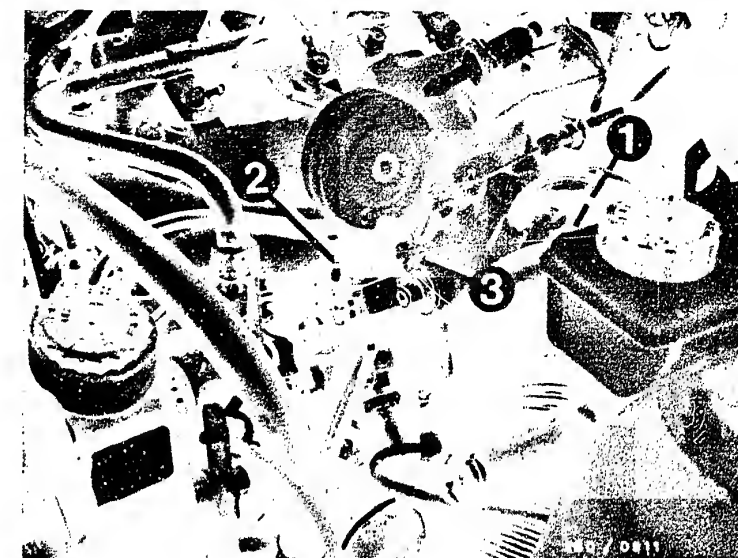
The roller should touch up against the idle stop. (Max. clearance between the accelerator roller and the idle stop 1 mm).

In the vehicle, step all the way down on the accelerator and check that the roller touches up against the full-load stop. If need be, adjust it.

- Test the kick-down cable (for vehicles with automatic transmissions). With the accelerator pedal all the way down, a dimension "A" of from 50.4...52.6 mm is to be attained. If need be, make an adjustment.

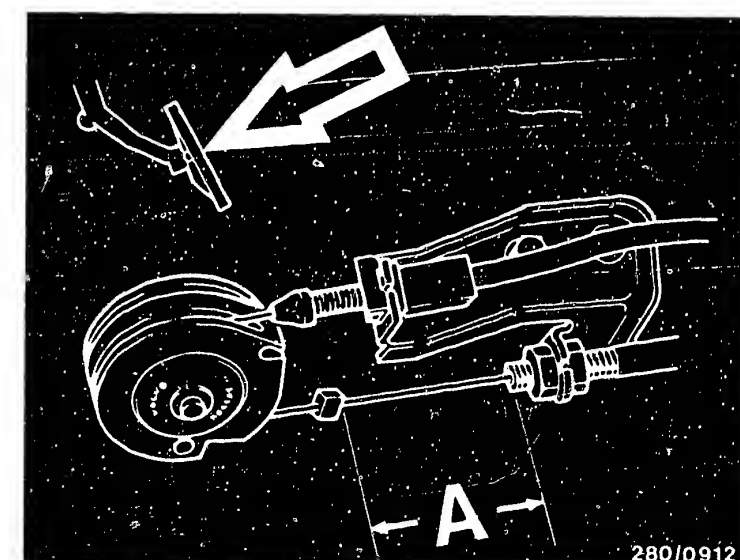
Yes

Continued on H15/H16



- 1 = Throttle-valve switch
- 2 = Accelerator linkage
- 3 = Throttle-valve stop screw

Kick-down adjustment  
(Vehicles with automatic transmissions)  
A=50.4...52.6 mm



280/0912

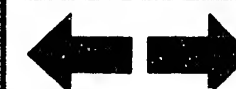
**H13**

Poor throttle take-up  
Volvo 240



**H14**

Poor throttle take-up  
Volvo 240



## Poor throttle take-up (continued)

Yes

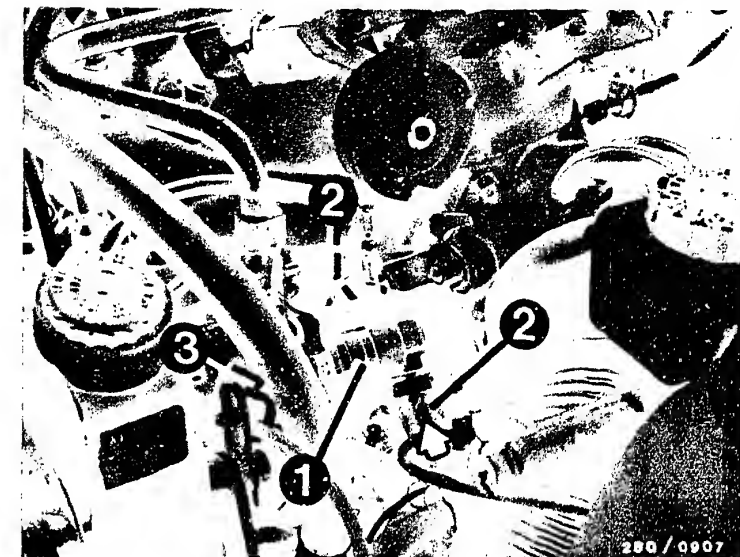
Is the idle actuator OK mechanically?

No

- The idle actuator is tested electrically and functionally using the universal test adapter.
- Mechanical test  
The idle actuator is tested for ease of movement as follows:
  - Take the idle actuator out. (Disconnect hoses.)
  - Disconnect the plug.
  - Join the center connection (Term. 4) to battery voltage.
  - Connect the outer connection (Term. 3) to ground.
  - By visual inspection, find out whether or not the rotary slider turns to the end stop.
  - Change the outer connection, i.e., connect Term. 5 to ground. The rotary slider must now turn to the opposite stop.If the idle actuator is defective, take it out and replace it.  
When installing the idle actuator, watch the direction of flow through it (arrow).

Yes

Continued on H17/H18



1 = Idle actuator  
2 = Connection hoses  
3 = Connection plug  
Arrow = Direction of throughflow

**H15**

Poor throttle take-up  
Volvo 240



**H16**

Poor throttle take-up  
Volvo 240



## Poor throttle take-up (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?

Between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

No

### Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

### Testing:

#### • Visual inspection:

- Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
- Is the wire screen on both sides OK?
- Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

#### • Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term. 6 and Term. 3:

0...1100  $\Omega$

Between Term. 5 and Term. 3:

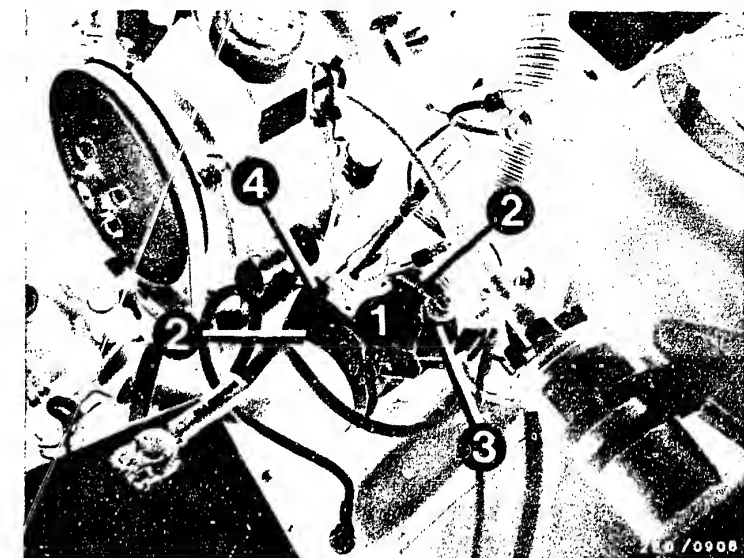
3.6...4.1  $\Omega$

If there are deviations, take out and replace the hot-wire air-mass sensor.

### Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak - unmetered air!)

Yes

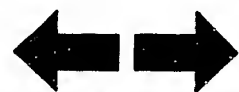


- 1 = Hot-wire air-mass sensor
- 2 = Hose clamps
- 3 = Bracket
- 4 = Potentiometer for idle-mixture-adjustment

Continued on H19/H20

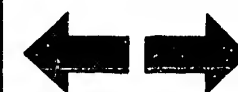
**H17**

Poor throttle take-up  
Volvo 240



**H18**

Poor throttle take-up  
Volvo 240





## Poor throttle take-up (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

### Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

### Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

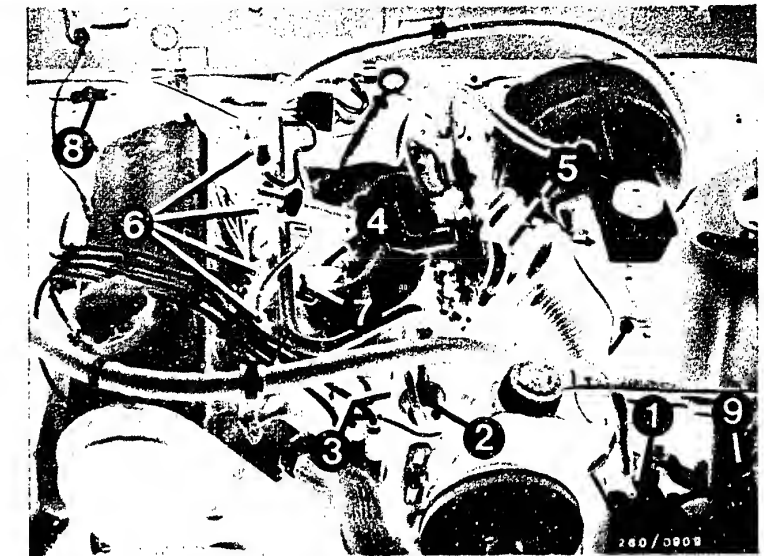
Yes

Checking of the customer complaint

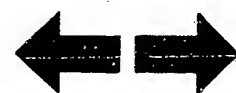
### \*Poor throttle take-up"

#### Further test instructions:

- Checking the lambda closed-loop control  
(Coordinates H1...H10)



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection



## ENGINE MISSING IN ALL DRIVING CONDITIONS

Trouble-shooting program according to customer complaint

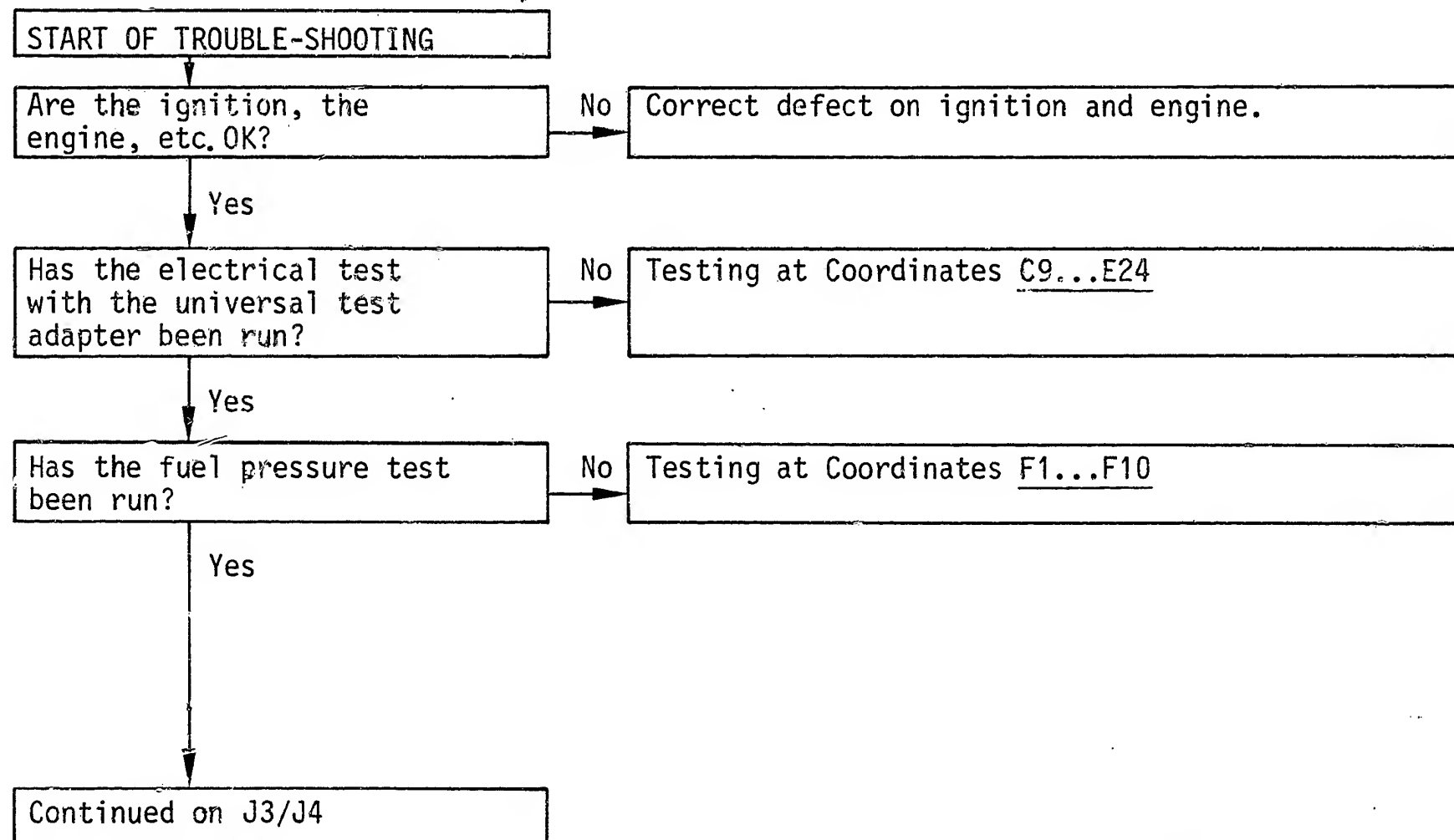
How to use the chart

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- The column at the left contains the questions for the tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



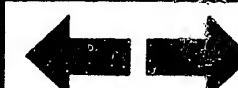
**J1**

Engine missing in all driving conditions  
Volvo 240



**J2**

Engine missing in all driving conditions  
Volvo 240



Engine missing in all driving conditions (continued)

Yes

Are the alternator and regulator OK?  
• No engine missing due to voltage peaks?

No

• With the engine shut off, disconnect the plug from the alternator. Start the engine. If the missing has been eliminated, check the alternator and regulator. Voltage peaks can be seen on the ignition oscilloscope.

Yes

Continued on J5/J6

J3

Engine missing in all driving conditions  
Volvo 240



J4

Engine missing in all driving conditions  
Volvo 240



## Engine missing in all driving conditions (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?

Between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

No

### Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

### Testing:

#### • Visual inspection:

- Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
- Is the wire screen on both sides OK?
- Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

#### • Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term. 6 and Term. 3:

0...1100  $\Omega$

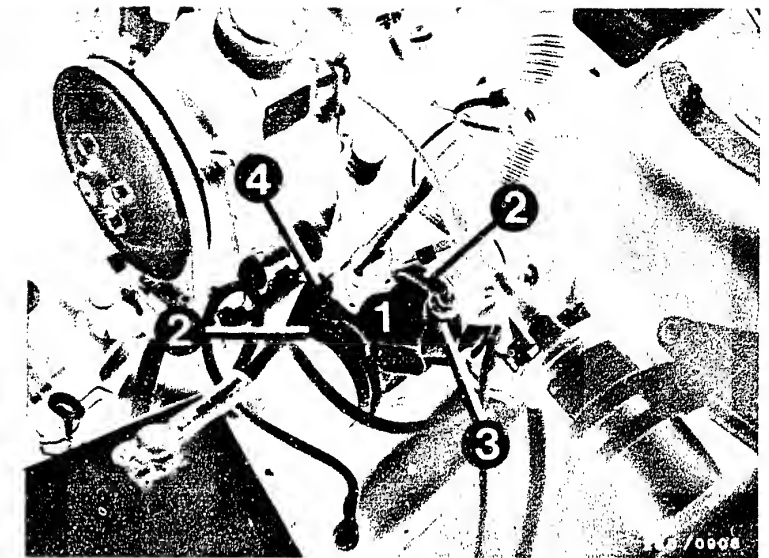
Between Term. 5 and Term. 3:

3.6...4.1  $\Omega$

If there are deviations, take out and replace the hot-wire air-mass sensor.

### Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak - unmetered air!)



- 1 = Hot-wire air-mass sensor
- 2 = Hose clamps
- 3 = Bracket
- 4 = Potentiometer for idle-mixture-adjustment

Yes

Continued on J7/J8

**J5**

Engine missing in all driving conditions  
Volvo 240



**J6**

Engine missing in all driving conditions  
Volvo 240



## Engine missing in all driving conditions (continued)

Yes

Is the fuel delivery of the electric fuel pump OK?

Test specification:  
min. 700 cm<sup>3</sup>/30 sec

No

### ● Measure the fuel delivery:

To test, take apart the connection between the fuel return connection (on the pressure regulator) and the fuel return line (to the fuel tank).

Connect the hose and direct it into a 5 l container with a measuring scale.

Disconnect the pump relay. Insert a jumper cable into the connection socket between Term. 87 and Term. 30.

The electric fuel pump must run.

Test specification:

Min.: 700 cm<sup>3</sup>/30 sec

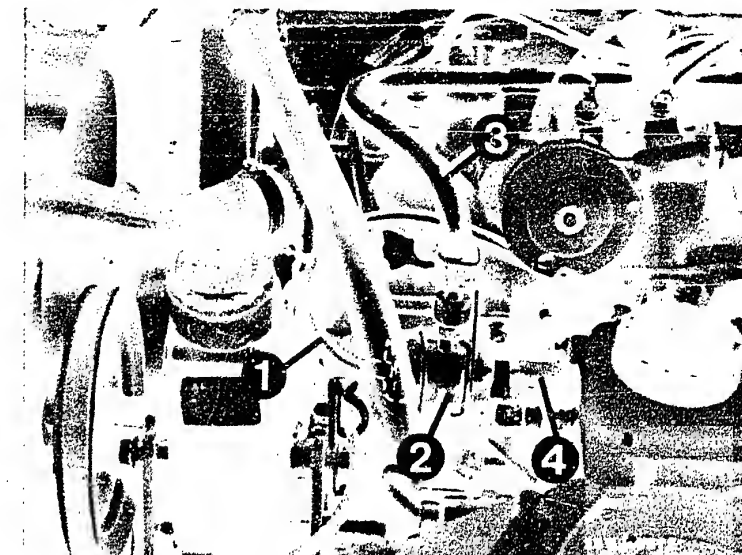
N.B.!

It is absolutely necessary to remove the jumper cable after completion of the test.

Corrective action if the test specification is not being attained:

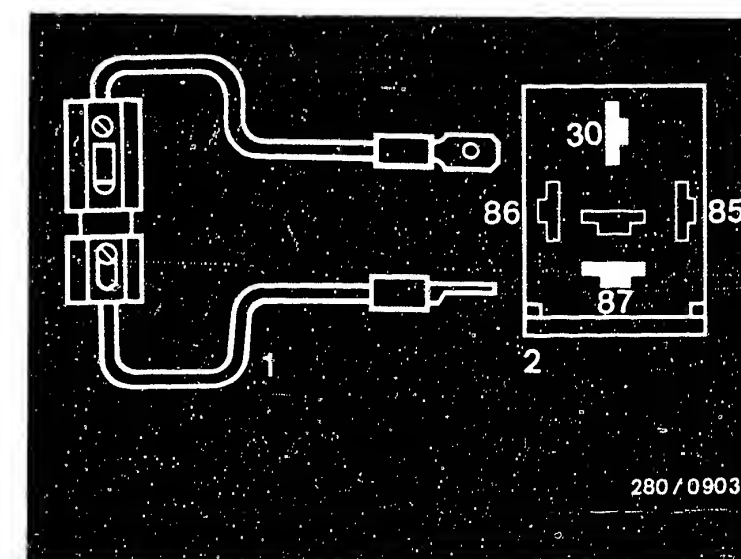
- Fuel filter is clogged: Take it out and replace it.
- Voltage at the connection terminals for the electric fuel pump with the engine running: min. 12 V. If not, clean the contacts, and eliminate any poor ground connection. Take out and replace the leads. Check the pump fuses.
- Pressure regulator is defective: Take it out and replace it.

Continued on J9/J10



- 1 = Intake manifold connection
- 2 = Pressure regulator
- 3 = Fuel distribution line (fuel delivery line)
- 4 = Fuel return line

- 1 = Jumper cable with fuse holder and 10 A fuse (user-fabricated)
- 2) Top view of connection socket



**J7**

Engine missing in all driving conditions  
Volvo 240



**J8**

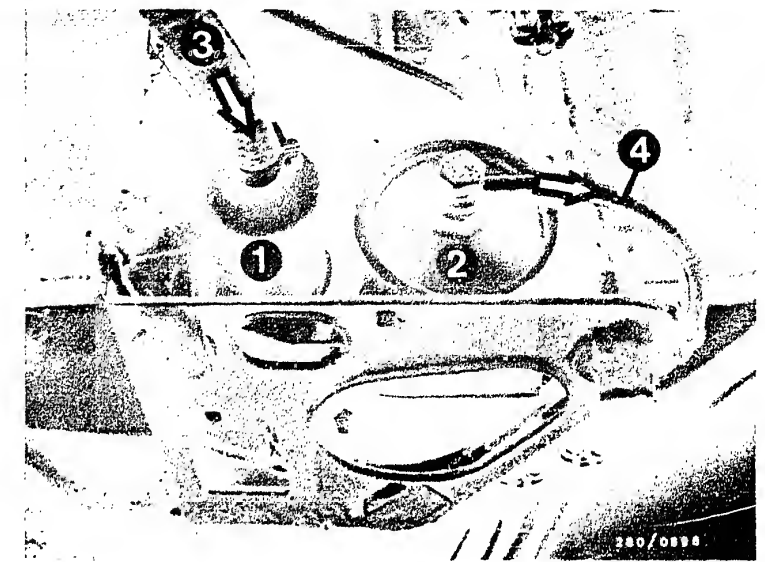
Engine missing in all driving conditions  
Volvo 240



## Engine missing in all driving conditions (continued)

Yes

- Check the pre-supply pump.  
Check by listening  
Disconnect the connection plug on the electric fuel pump. Ignition "ON", open the air-flow sensor flap by hand. The pre-supply pump must run. If not, check the connection leads and if need be, take out and replace the pre-supply pump.
- Fuel pump output too low: Take out and replace the fuel pump.  
Testing has been completed: Remove the jumper cable from the connection socket and plug in the pump relay. Reconnect the fuel lines at the pressure regulator and check the connections for leaks.



- 1 = Electric fuel pump
- 2 = Fuel filter
- 3 = Fuel suction line
- 4 = Fuel delivery line

Is the control unit OK?

- Does the engine run without missing?
- Are plug connections on the control unit plug OK?

No

- Have the engine run.
- Shake the control unit lightly and move the control unit plug.  
Watch for motor missing.
- Correct the plug connection on the multiple plug, or take out and replace a defective control unit.

Yes

Does the engine cough in overrun cutoff?

- Is the exhaust system free of leaks?

No

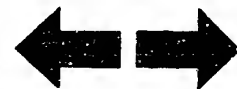
- Check the exhaust system for leaks.

Yes

Continued on J11/J12

**J9**

Engine missing in all driving conditions  
Volvo 240



**J10**

Engine missing in all driving conditions  
Volvo 240





# Engine missing in all driving conditions (continued)

Yes

Is there engine coughing on overrun?  
Is the throttle valve closed?  
• Does the throttle valve lever strike against the stop screw?

No

- Checking:  
Find out if it is possible to close the throttle valve even further, causing the engine speed to drop.
- Throttle valve adjustment:
  - Take the accelerator linkage off the throttle valve.
  - Release the throttle valve switch.
  - Release the throttle valve stop screw and turn it back until it leaves the stop. After that, turn it out again until it touches the stop and turn it 1/4 turn further. Secure the screw in place.

Yes

Is there engine coughing on overrun?  
Is the throttle valve switch set correctly?

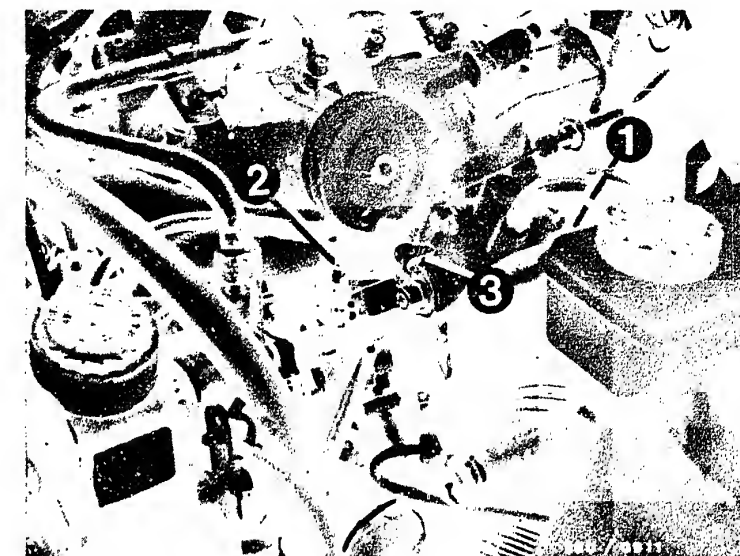
No

- Does the idle contact close?
- Does the microswitch click audibly?
- Is the accelerator cable free of tension?
- Is the accelerator cable free of kinking?

- Adjustment of the throttle valve switch:  
Connect an ohmmeter to the throttle valve switch between Term. 2 and Term. 18. Turn the throttle valve switch to the left until the idle contact closes. (The microswitch clicks audibly.) Reading 0  $\Omega$ .
- Checking the setting:  
Pull on the accelerator cable somewhat. The idle contact opens. (The microswitch clicks audibly.) Reading  $\infty \Omega$ .  
Refasten the throttle valve switch.
- Check the accelerator cable roller for ease of movement.  
The roller is supposed to lie up against the idle stop. (Max. clearance between the accelerator roller and the idle stop 1 mm.) In the vehicle, step on the accelerator and check whether the roller lies against the full load stop. If need be, adjust it.
- Check the kick-down cable (for vehicles with automatic transmissions). With the accelerator down all the way (step down on the accelerator pedal), a dimension "A" of 50.4...52.6 mm should be attained. If need be, adjust it.

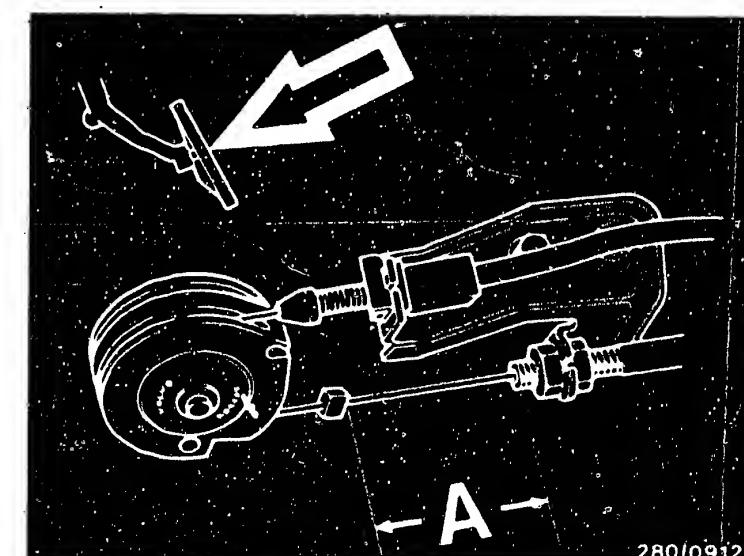
Yes

Continued on J13/J14



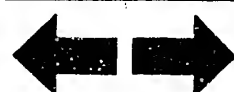
- 1 = Throttle valve switch
- 2 = Accelerator linkage
- 3 = Throttle valve stop screw

Kick-down adjustment  
(Vehicles with automatic transmission)  
A=50.4...52.6 mm



J11

Engine missing in all driving conditions  
Volvo 240



J12

Engine missing in all driving conditions  
Volvo 240



# Engine missing in all driving conditions (continued)

Yes

Is there engine coughing on overrun?

Is the overrun cutoff OK?

- Is the operation of the control unit OK?
- Is the reinstatement speed OK?

Cold: approx.  $2300 \text{ min}^{-1}$

Warm: approx.  $1350 \text{ min}^{-1}$

No

- Check the operation of the overrun cutoff:

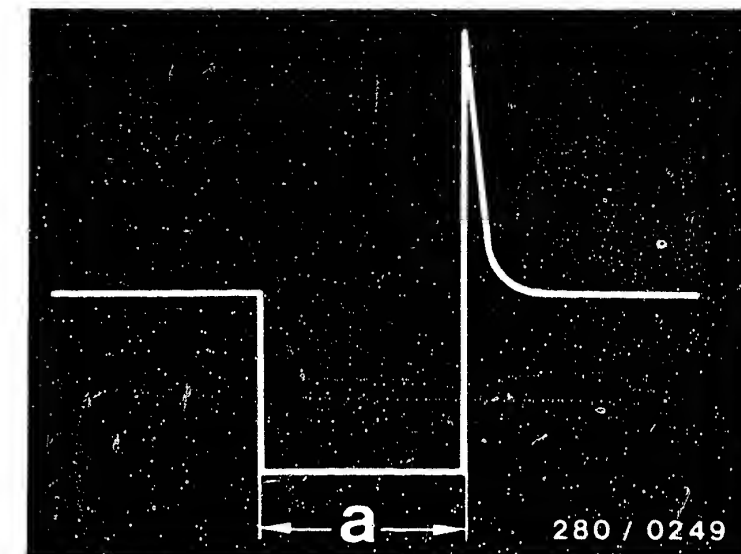
Connect the test lead as follows:

The 2-pole plug terminals of the test lead are connected between one solenoid-operated fuel-injection valve and its connection lead. Of the two other connection terminals on the test lead, only one must be connected to the special input on the motortester. If the connection is correct, the pattern shown at the right appears on the oscilloscope. Watch the oscilloscope!

- Slowly run the engine up to  $3000 \text{ min}^{-1}$ . Fuel inject pulses must appear on the oscilloscope. Remove your foot from the accelerator pedal (idle setting). There are no longer any fuel injection pulses present.
- Engine clearly at less than ambient temperature. ( $+15^{\circ}\text{C} \dots +30^{\circ}\text{C}$ ): Starting from approx.  $2300 \text{ min}^{-1}$ , fuel-injection pulses must again appear. The cutoff speed is at approx.  $400 \text{ min}^{-1}$  higher.
- Engine at normal operating temperature (approx.  $+80^{\circ}\text{C}$ ): From approx.  $1350 \text{ min}^{-1}$ , fuel-injection pulses must reappear. The cutoff speed lies at approx.  $700 \text{ min}^{-1}$  higher. If there is a malfunction, take out and replace the control unit.

Yes

Continued on J15/J16



Fuel-injection pulse from a switched output stage  
(Measured at the injection valves)  
a = Pulse length (dependent on the engine load)

**J13**

Engine missing in all driving conditions

Volvo 240



**J14**

Engine missing in all driving conditions

Volvo 240



# Engine missing in all driving conditions (continued)

Has the operation of the solenoid-operated fuel-injection valves been checked?

Has the injection signal been checked for missing?

- Fuel-injection pulses without interference or missing?
- Have the leads been properly laid?
- No loose contacts in the plug connections?

No

- Connect the test lead as follows:  
The 2-pole plug connections on the test lead are connected between one solenoid-operated fuel-injection valve and its connection lead. Of the two other connection terminals on the test lead, only one connection terminal must be connected to the special input on the motortester.
- If the connection is correct, the pattern shown at the right appears on the oscilloscope. Using the test lead, the fuel injection pulses at the solenoid-operated fuel-injection valves can be checked while the engine is running using an ignition oscilloscope. If the pattern shown at the right is not obtained or if there are deviations (interference, missing, etc), the other solenoid-operated fuel-injection valves should also be examined.
- If there is interference: Check how the leads have been laid.
- If there is missing: Eliminate loose contacts in the leads or in the plug connections.

Yes

Is the solenoid-operated fuel-injection valve OK mechanically?

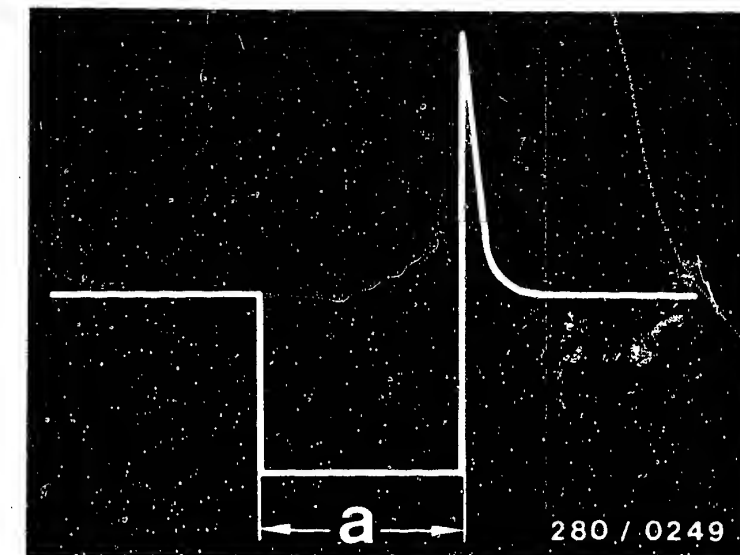
- Does the engine speed drop off when the fuel-injection valve connectors are unplugged individually?

No

- With the engine running, disconnect the solenoid-operated fuel-injection valve connectors individually one after the other from the solenoid-operated fuel-injection valves, and then plug them back on. If the solenoid-operated fuel-injection valve is good, the engine speed must drop off.

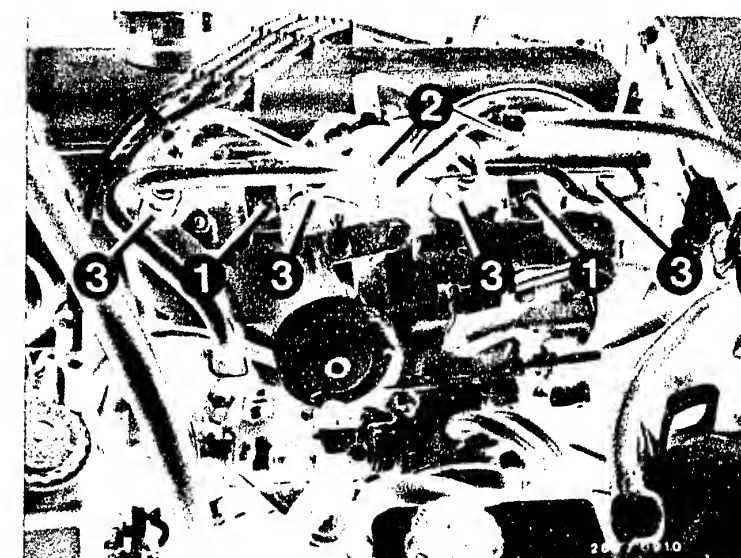
Yes

Continued on J17/J18



Fuel-injection pulse from a switched output stage  
(Measured on the injection valve)  
a = Pulse length (dependent on the engine load).

3 = Solenoid-operated fuel-injection valves



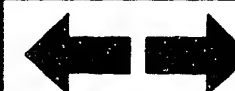
**J15**

Engine missing in all driving conditions  
Volvo 240



**J16**

Engine missing in all driving conditions  
Volvo 240



# Engine missing in all driving conditions (continued)

Are the solenoid-operated fuel-injection valves OK?

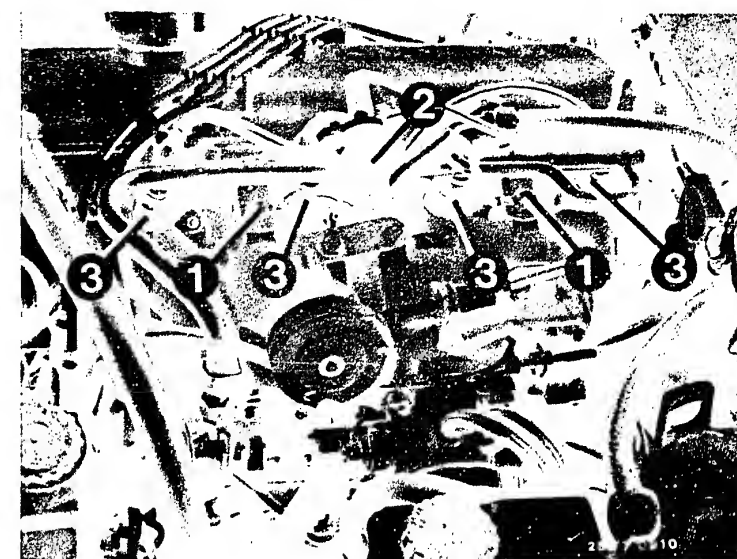
- Removal and installation
- Is the O-ring OK?

No

## Removal

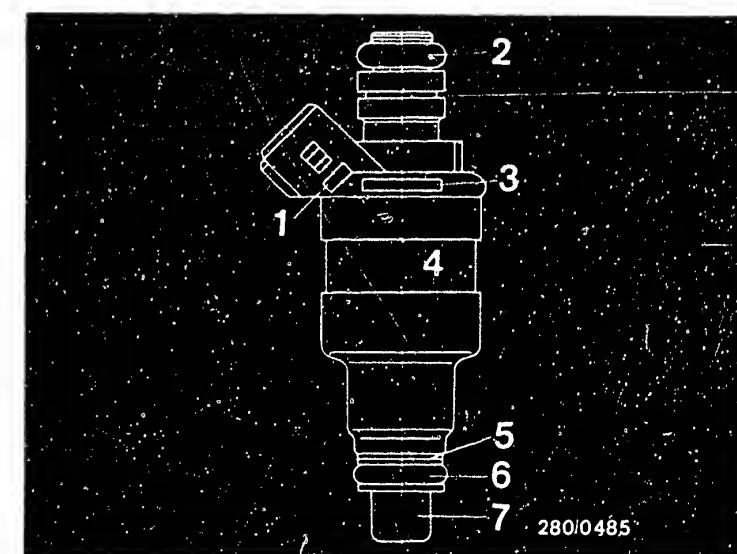
- Take out the fuel distribution pipe with the solenoid-operated fuel-injection valves.
  - Take off the hose.
  - Release the fastening screws at the fuel distribution pipe and at the pressure regulator.
  - Pull all 4 solenoid-operated fuel-injection valves out of the cylinder head simultaneously and carefully.
- Taking out and replacing a solenoid-operated fuel-injection valve.
  - Disconnect the electrical connection.
  - Carefully shove the holding bracket out of the slot.
  - Carefully pull a defective solenoid-operated fuel-injection valve out of the fuel distribution pipe. Caution! Catch any fuel that escapes. Do not allow it to drip on hot portions of the engine. Caution! Before installation, the two O-rings may be greased only lightly (silicone grease Ft 2 v 1). The other parts of the solenoid-operated fuel-injection valves must remain free of grease.
- Cut the O-ring (intake tube) to pieces. Caution! Do not damage the protection sleeve. Pull a new O-ring over the protection sleeve and its collar. In so doing, do not damage any parts.
- Use set of parts 1 287 010 704. When working on the solenoid-operated fuel-injection valves, do not damage the valve needle. If the top O-ring (fuel distribution pipe connection) is swollen or damaged, it also must be taken out and replaced.

Yes



- 1 = Fastening screws
- 2 = Hose
- 3 = Solenoid-operated fuel-injection valves

- 1 = FD marking
- 2 = Top O-ring
- 3 = Part No.
- 4 = Solenoid-operated fuel-injection valve
- 5 = Supporting plate
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on J21/J22

**J17**

Engine missing in all driving conditions

Volvo 240



**J18**

Engine missing in all driving conditions

Volvo 240



Engine missing in all driving conditions (continued)

Yes

Caution! Before installation, the two O-rings may be greased only lightly (silicone grease Ft 2 v 1).

The other parts of the solenoid-operated fuel-injection valves must remain free of grease.

Installation

- Carefully put the new solenoid-operated fuel-injection valve on the fuel distribution pipe.
- Shove the holding bracket into the slot until it catches. (Check the connection for leaks.)
- Plug in the electrical connection. (Good contact)
- Carefully introduce all 4 solenoid-operated fuel-injection valves into the intake manifold simultaneously with the fuel distribution pipe.

Caution!

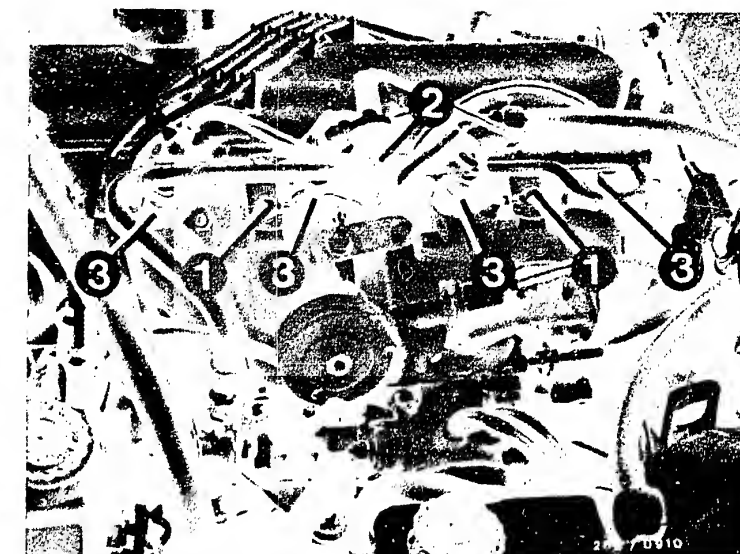
Do not damage any O-rings or solenoid-operated fuel-injection valve needles!

- Fasten the pressure regulator and the fuel-distribution pipe with the screws. (Check for leaks.)

Make sure there is good ground contact for the ground terminals.

- Fasten the hose.

After testing or installation, the original condition of installation must be restored. Check for leaks.



3 = Solenoid-operated fuel-injection valves

1 = FD marking

2 = Top O-ring

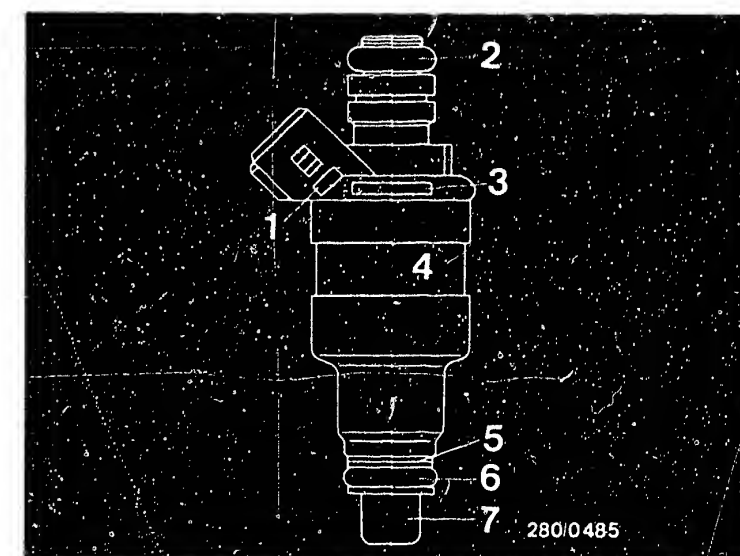
3 = Part No.

4 = Solenoid-operated fuel-injection valve

5 = Supporting plate

6 = Bottom O-ring

7 = Protection sleeve



Continued on J21/J22

**J19**

Engine missing in all driving conditions  
Volvo 240



**J20**

Engine missing in all driving conditions  
Volvo 240





## Engine missing in all driving conditions (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

### Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

### Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

Yes

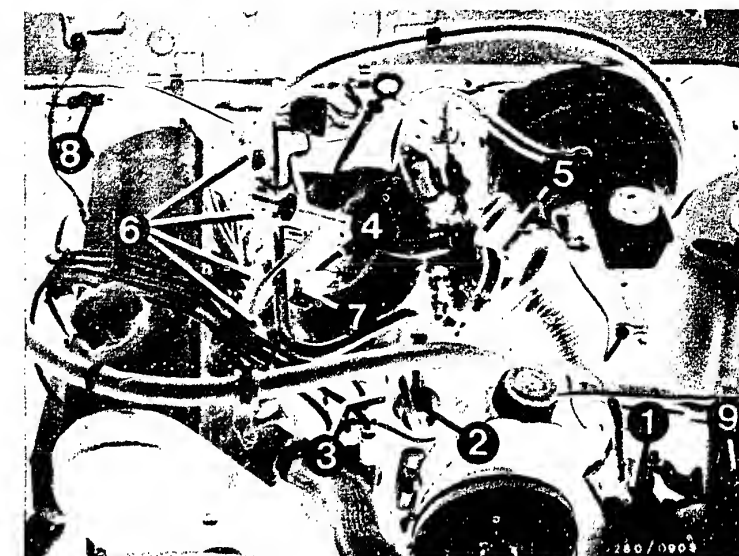
Trouble-shooting program  
for the customer complaint

"Engine missing in all  
driving conditions"

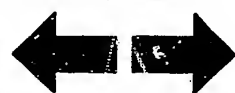
has been completed.

Further testing instructions

- Checking the lambda closed-loop control (Coordinates H1...H10)



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection





## POOR MILEAGE

Trouble-shooting program according to customer complaint

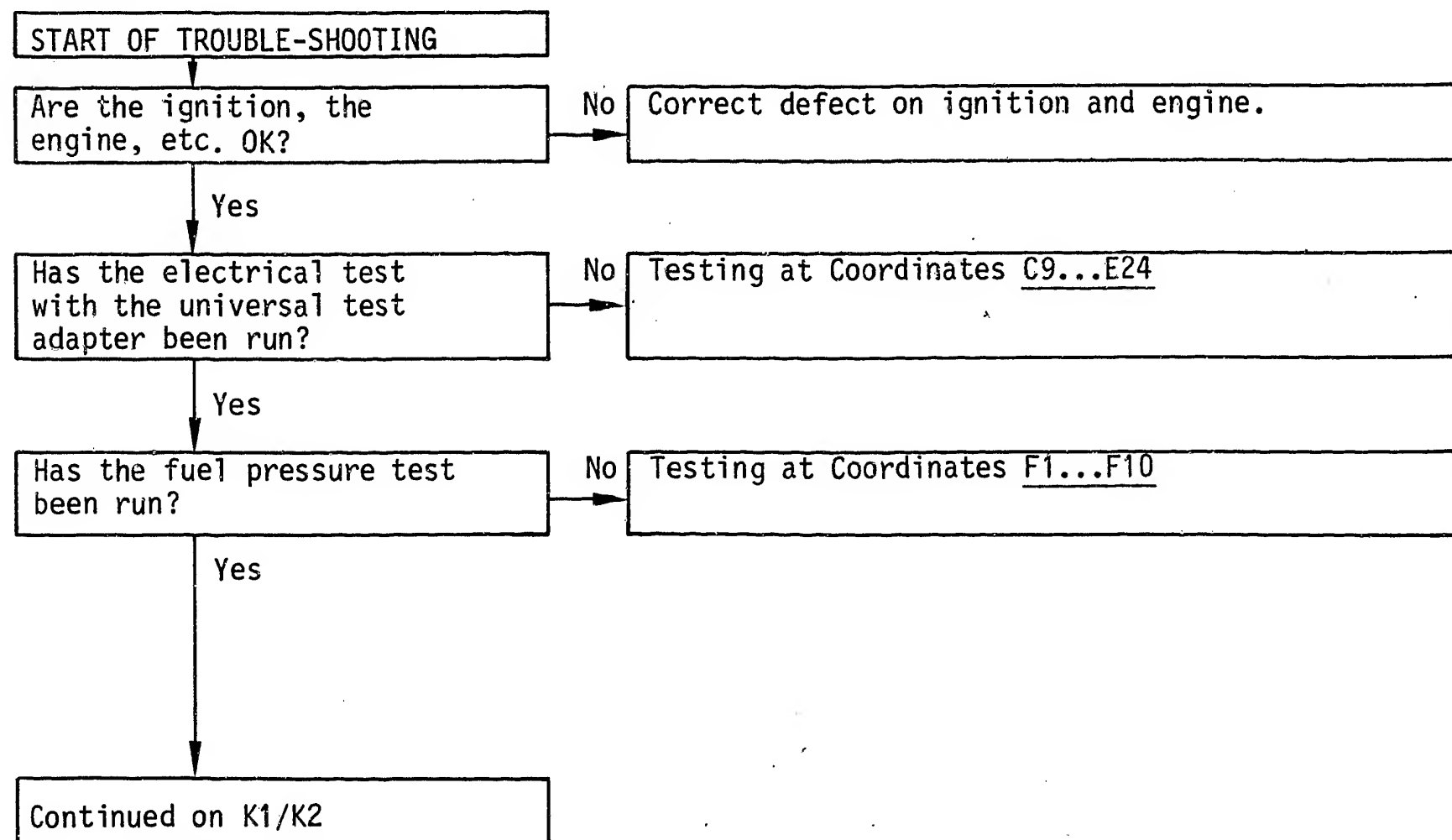
How to use the chart

The testing has been organized into 3 columns of boxes:

- The column at the left contains the questions for tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



**J23**

Poor mileage  
Volvo 240



**J24**

Poor mileage  
Volvo 240



## Poor mileage (continued)

Are the solenoid-operated fuel-injection valves OK with respect to leakage?

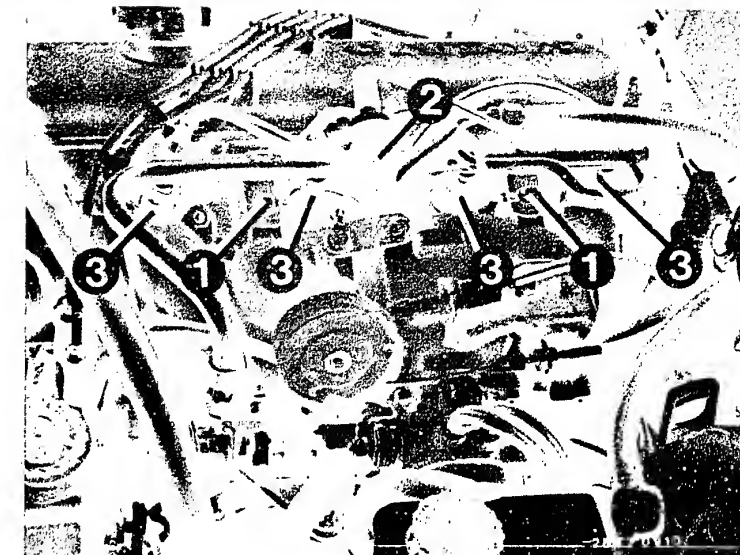
No

### Checking the solenoid-operated fuel-injection valves for leaks

- Take out the fuel distribution pipe and the solenoid-operated fuel-injection valves:
  - Disconnect the hose.
  - Release the fastening screws on the fuel distribution pipe and the pressure regulator.
  - Pull all 4 solenoid-operated fuel-injection valves out of the cylinder head simultaneously, and carefully.
- Build up the fuel pressure:  
Jump the safety circuit. The electric fuel pump must run.  
Caution:  
Make certain no fuel gets on hot portions of the engine.
- Test specification:  
No drop may drip from the opening of the solenoid-operated fuel-injection valve within 60 seconds. If there is a defect, take out and replace the solenoid-operated fuel-injection valve.
- Removal:
  - Disconnect the electrical connection.
  - Carefully shove the holding bracket out of the
  - Carefully pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe.

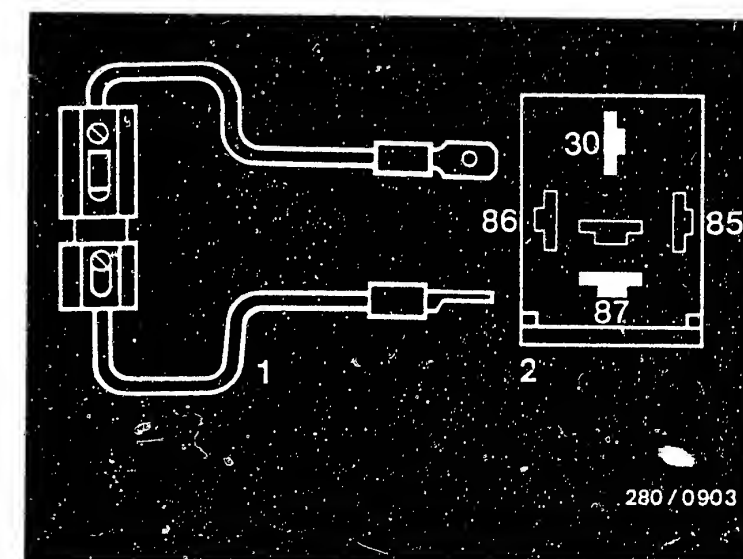
Yes

Continued on K3/K4



- 1 = Fastening screws
- 2 = Hose
- 3 = Solenoid-operated fuel-injection valves

- 1 = Jumper cable with fuse holder and 10 A fuse (user-fabricated)
- 2 = Top view of connection socket



280 / 0903

**K1**

Poor mileage  
Volvo 240



**K2**

Poor mileage  
Volvo 240



Poor mileage (continued)

Yes

Caution: Catch fuel that escapes. Do not allow it to drip onto hot portions of the engine.

Caution!

Before the two O-rings are put in, they may be greased only lightly (silicone grease Ft 2 v 1). The other parts of the solenoid-operated fuel-injection valve must remain free of grease.

● Installation

- Carefully put new solenoid-operated fuel-injection valve onto the fuel distribution pipe.
- Shove the holding bracket into the slot until it catches. (Check the connection for leaks.)

Caution!

After testing, restore the original condition of installation. (Put in the hose.) Check for leaks (unmetered air).

Continued on K5/K6

**K3**

Poor mileage  
Volvo 240



**K4**

Poor mileage  
Volvo 240



## Poor mileage (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?

Between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

No

### Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

### Testing:

#### • Visual inspection:

- Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
- Is the wire screen on both sides OK?
- Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

#### • Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

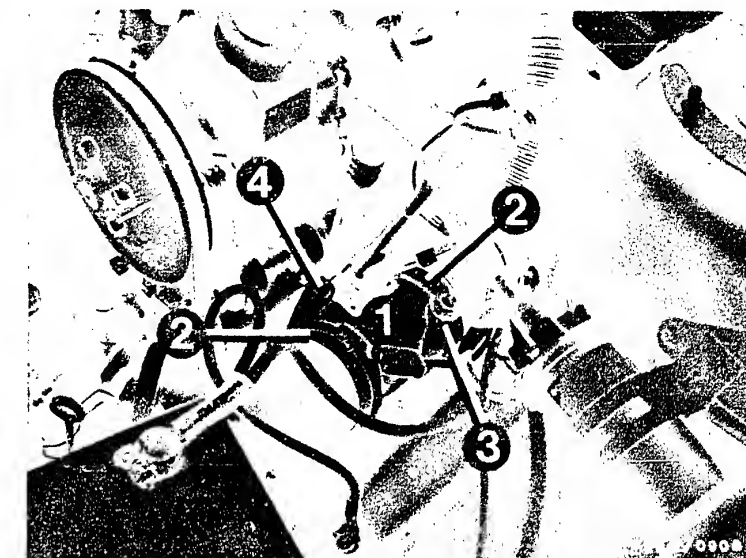
If there are deviations, take out and replace the hot-wire air-mass sensor.

### Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak (unmetered air!))

Yes

Continued on K7/K8



- 1 = Hot-wire air-mass sensor
- 2 = Hose clamps
- 3 = Bracket
- 4 = Potentiometer for idle-mixture-adjustment

**K5**

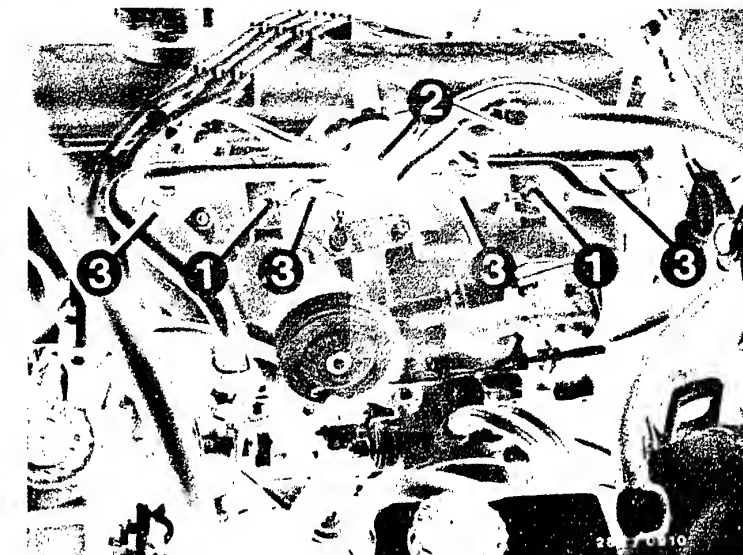
Poor mileage  
Volvo 240



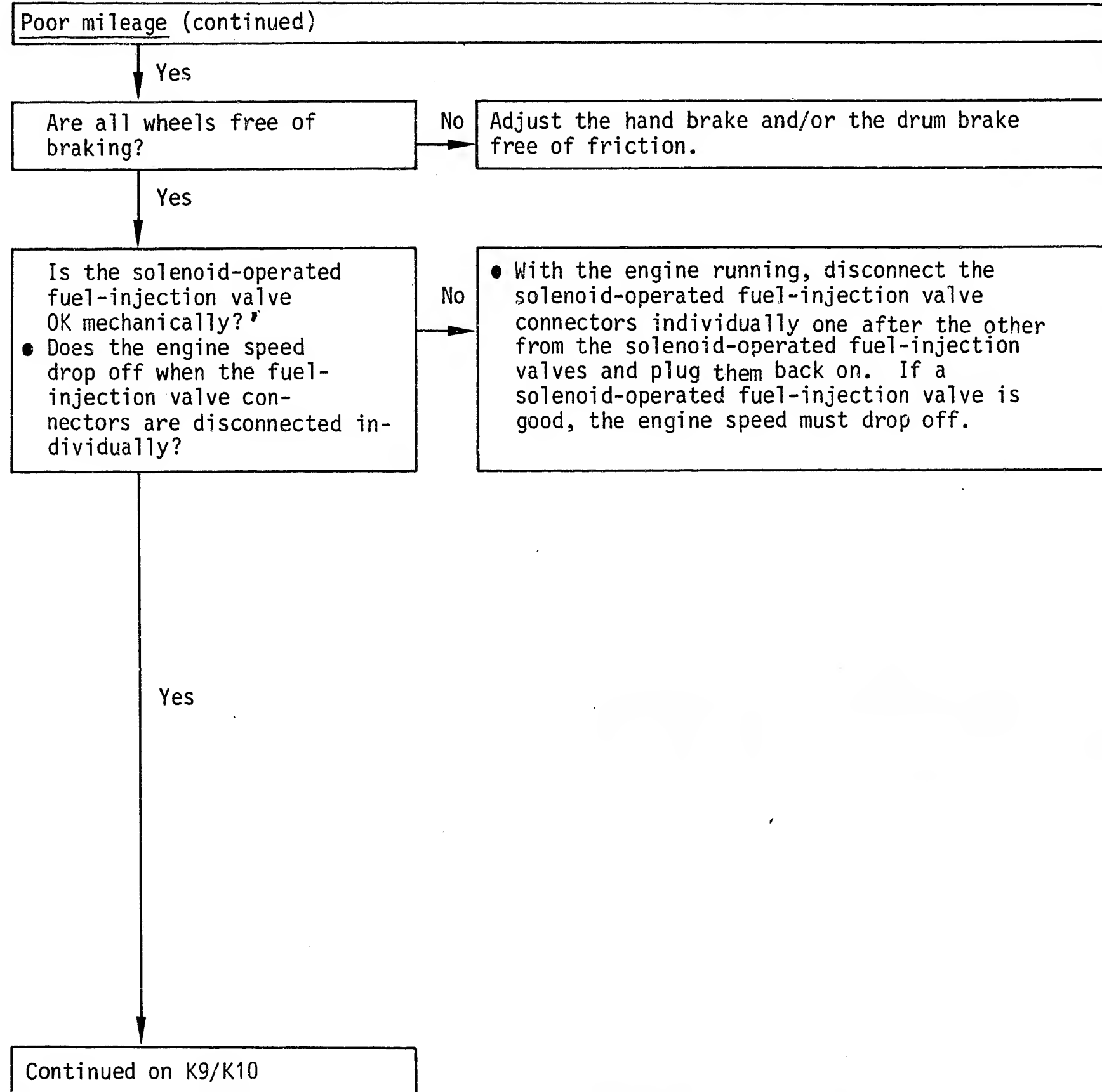
**K6**

Poor mileage  
Volvo 240





3 = Solenoid-operated fuel-injection valves



K7

Poor mileage  
Volvo 240



K8

Poor mileage  
Volvo 240



# Poor mileage (continued)

Are the solenoid-operated fuel-injection valves OK?

- Removal and installation
- Is the O-ring OK?

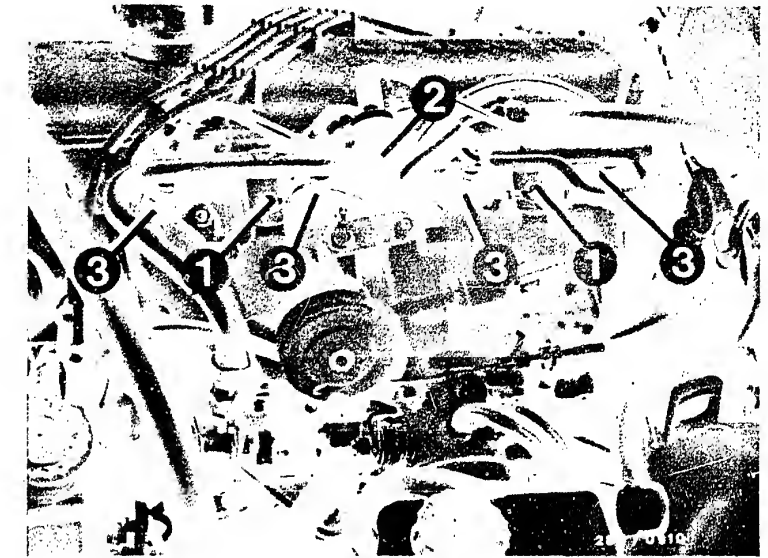
No

## Removal

- Take out the fuel distribution pipe with the solenoid-operated fuel-injection valves.
  - Take off the hose.
  - Release the fastening screws at the fuel distribution pipe and at the pressure regulator.
  - Pull all 4 solenoid-operated fuel-injection valves out of the cylinder head simultaneously and carefully.
- Taking out and replacing a solenoid-operated fuel-injection valve.
  - Disconnect the electrical connection.
  - Carefully shove the holding bracket out of the slot.
  - Carefully pull a defective solenoid-operated fuel-injection valve out of the fuel distribution pipe. Caution! Catch any fuel that escapes. Do not allow it to drip on hot portions of the engine. Caution! Before installation, the two O-rings may be greased only lightly (silicone grease Ft 2 v 1). The other parts of the solenoid-operated fuel-injection valves must remain free of grease.
- Cut the O-ring (intake tube) to pieces. Caution! Do not damage the protection sleeve. Pull a new O-ring over the protection sleeve and its collar. In so doing, do not damage any parts.
- Use set of parts 1 287 010 704. When working on the solenoid-operated fuel-injection valves, do not damage the valve needle. If the top O-ring (fuel distribution pipe connection) is swollen or damaged, it also must be taken out and replaced.

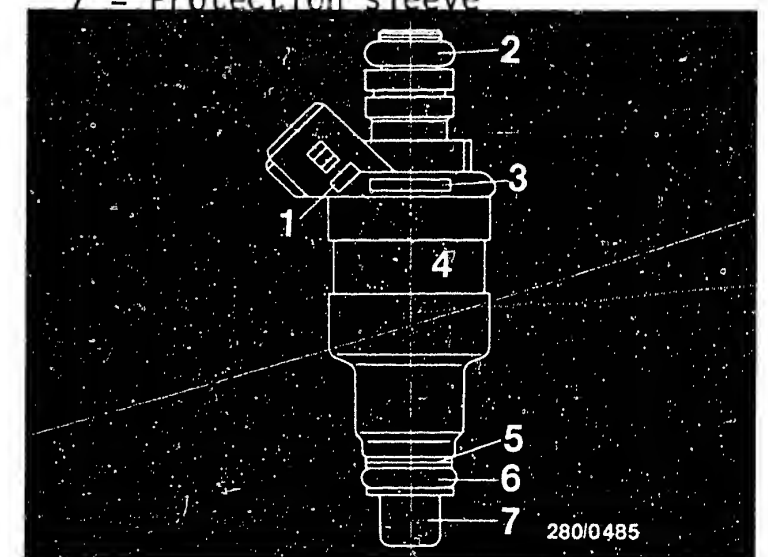
Yes

Continued on K11/K12



- 1 = Fastening screws
- 2 = Hose
- 3 = Solenoid-operated fuel-injection valves

- 1 = FD marking
- 2 = Top O-ring
- 3 = Part No.
- 4 = Solenoid-operated fuel-injection valve
- 5 = Supporting plate
- 6 = Bottom O-ring
- 7 = Protection sleeve



K9

Poor mileage  
Volvo 240



K10

Poor mileage  
Volvo 240





# Poor mileage (continued)

Yes

Continued on K13/K14

**Caution!** Before installation, the two O-rings may be greased only lightly (silicone grease Ft 2 v 1).

The other parts of the solenoid-operated fuel-injection valves must remain free of grease.

## Installation

- Carefully put the new solenoid-operated fuel-injection valve on the fuel distribution pipe.
- Shove the holding bracket into the slot until it catches. (Check the connection for leaks.)
- Plug in the electrical connection. (Good contact)
- Carefully introduce all 4 solenoid-operated fuel-injection valves into the intake manifold simultaneously with the fuel distribution pipe.

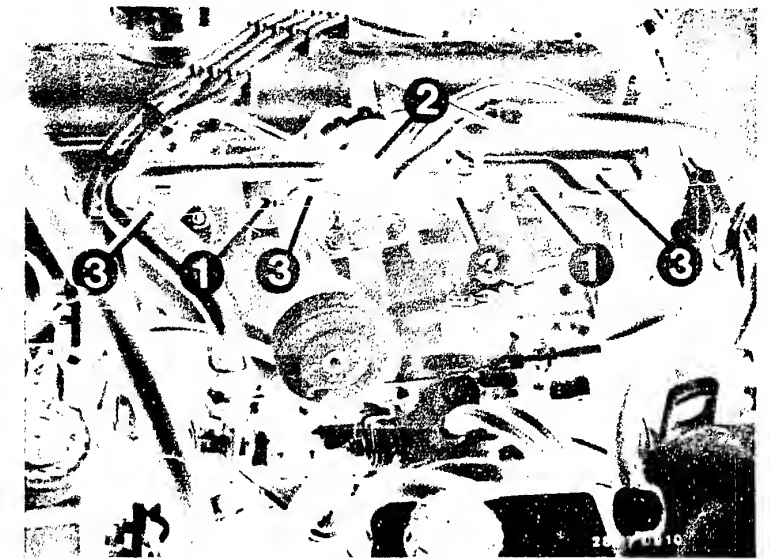
**Caution!** Do not damage any O-rings or solenoid-operated fuel-injection valve needles!

- Fasten the pressure regulator and the fuel-distribution pipe with the screws. (Check for leaks.)

Make sure there is good ground contact for the ground terminals.

- Fasten the hose.

After testing or installation, the original condition of installation must be restored. Check for leaks.



3 = Solenoid-operated fuel-injection valves

1 = FD marking

2 = Top O-ring

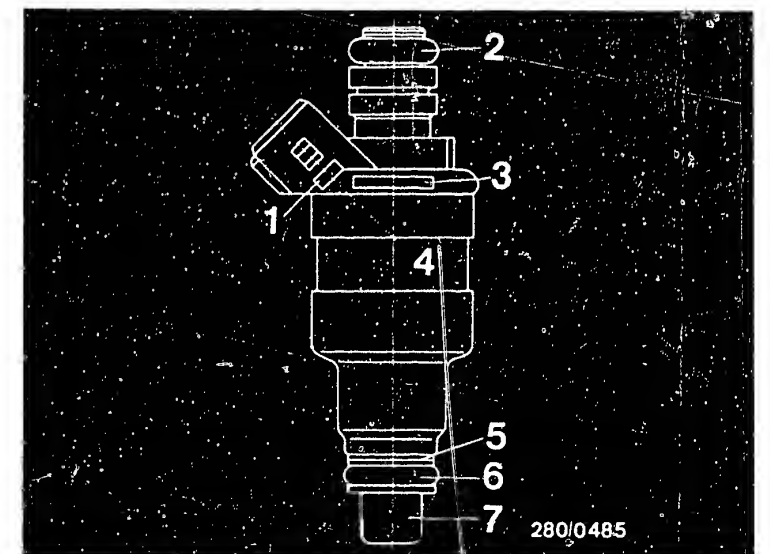
3 = Part No.

4 = Solenoid-operated fuel-injection valve

5 = Supporting plate

6 = Bottom O-ring

7 = Protection sleeve



**K11**

Poor mileage  
Volvo 240



**K12**

Poor mileage  
Volvo 240



## Poor mileage (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

### Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

### Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

Yes

Checking of the customer complaint

"Poor mileage"

has been completed.

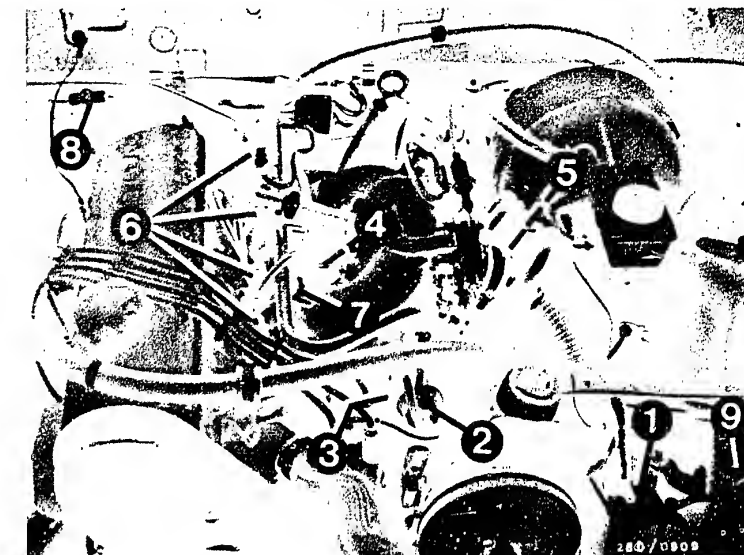
Further test instructions:

- o Checking the lambda closed-loop control  
(Coordinates H1...H10)

No

### Other possible defects:

- The customer complaint has been incorrectly identified. (See Coordinates C3...C8). If the defect has not been identified using the "targeted trouble-shooting" see the "detailed trouble-shooting" (Coordinates C3/C4).
- The engine is not OK mechanically. (Compression, valve setting, valve timing, wear on camshaft).



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection

**K13**

Poor mileage  
Volvo 240



**K14**

Poor mileage  
Volvo 240



## INSUFFICIENT MAX. ENGINE POWER OR MAX. VELOCITY

Trouble-shooting program according to customer complaint

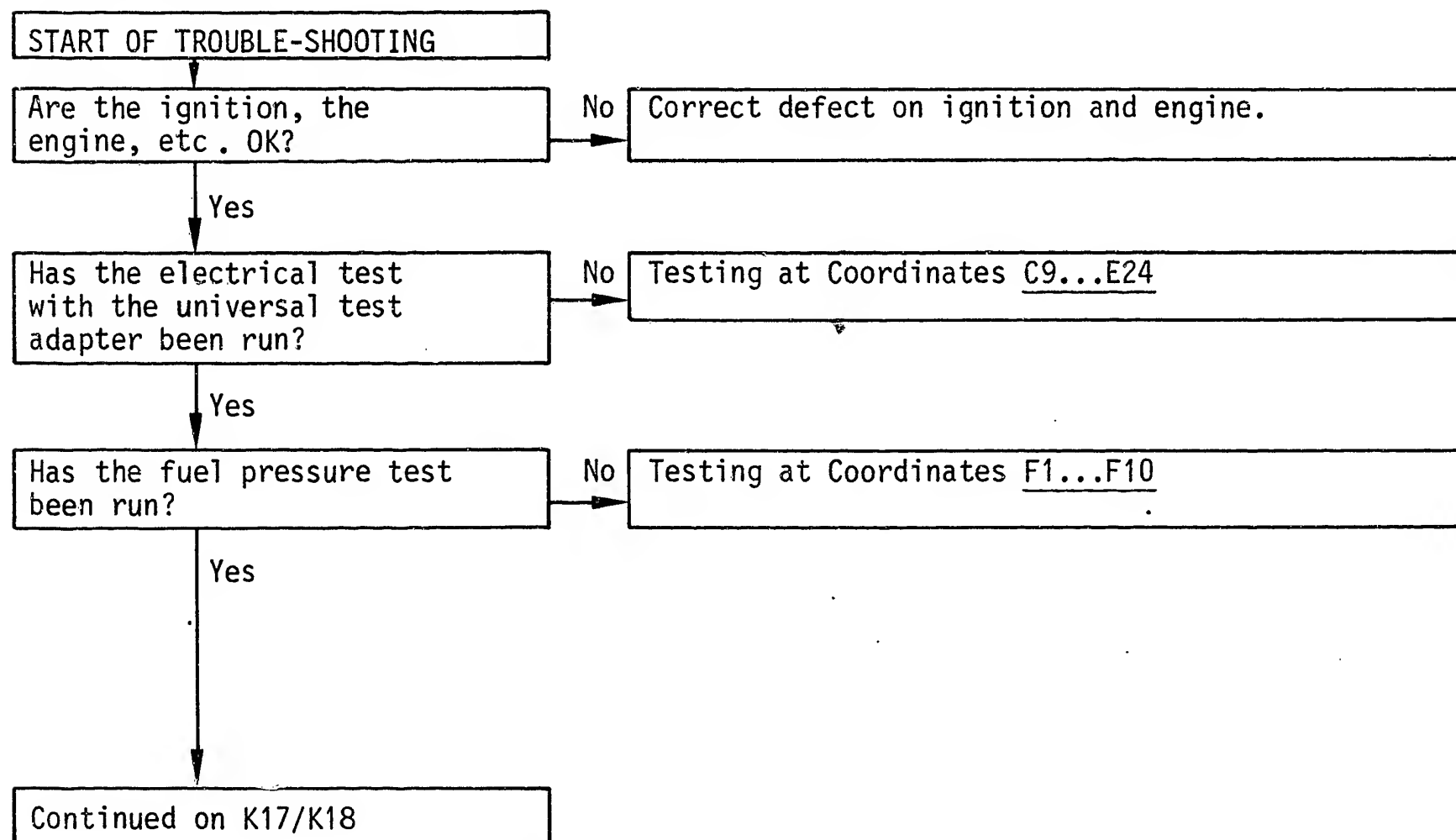
How to use the chart

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If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



**K15**

Insufficient max. engine power  
Volvo 240



**K16**

Insufficient max. engine power  
Volvo 240



# Insufficient max. engine power or max. velocity (continued)

Yes

Does the throttle valve open all the way?

- Are the accelerator pedal, accelerator linkage, accelerator cable OK?

No

- The accelerator linkage can jam due to the floor carpeting.
- If the accelerator cable is kinked, take it out and replace it.

Yes

Is the throttle valve switch OK?

- Does the length of the fuel-injection pulse at idle change when Term. 3 and Term. 18 are jumped (full-load enrichment)?

No

Connect the test lead as follows:

One connection of the test lead is connected between one solenoid-operated fuel-injection valve and its connection leads. Of the two other connection terminals, only one connection terminal must be connected to the special input on the motortester.

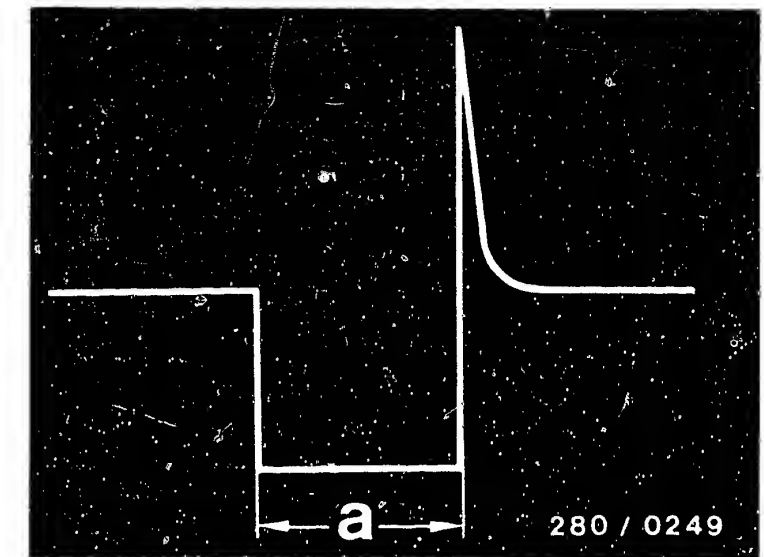
**Caution!**

The other connection terminal must not come into contact with the vehicle ground!

- If the connection is correct, the pattern shown at the right appears on the oscilloscope. Using the test lead, the fuel-injection pulses at the solenoid-operated fuel-injection valves can be tested while the engine is running using an ignition oscilloscope.
- Check the full-load enrichment: Watch the fuel-injection pulses at idle. Disconnect the throttle valve switch connecting plug and jump Term. 3 and Term. 18. (Insulated wire jumper cable).
- **Caution!** Do not bend any plug prongs. The fuel-injection pulse must become longer. If not, take out and replace the control unit.
- **Caution!** After testing, restore the original condition of installation.

Yes

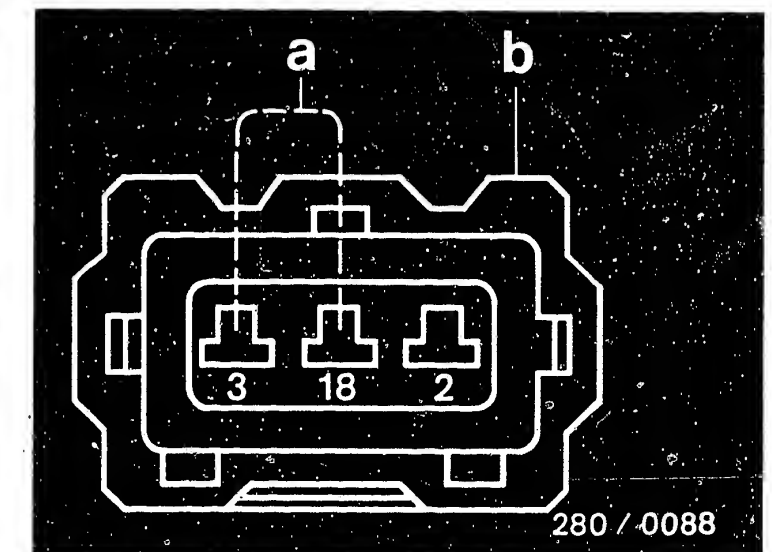
Continued on K19/K20



Fuel-injection pulse for a switched output stage (measured at the solenoid-operated fuel-injection valve)

a = Pulse length (dependent on the engine load)

a = Wire jumper cable (insulated)  
b = Throttle valve switch (connection plug)



**K17**

Insufficient max. engine power  
Volvo 240



**K18**

Insufficient max. engine power  
Volvo 240



Insufficient max. engine power or max. velocity (continued)

Yes

Is the fuel delivery on the electric fuel pump OK?

Test specification:  
min. 700 cm<sup>3</sup>/30 sec

No

● Measure the fuel delivery:

To test, take apart the connection between the fuel return connection (on the pressure regulator) and the fuel return line (to the fuel tank).

Connect the hose and direct it into a 5 l container with a measuring scale.

Disconnect the pump relay. Insert a jumper cable into the connection socket between Term. 87 and Term. 30.

The electric fuel pump must run.

Test specification:

Min.: 700 cm<sup>3</sup>/30 sec

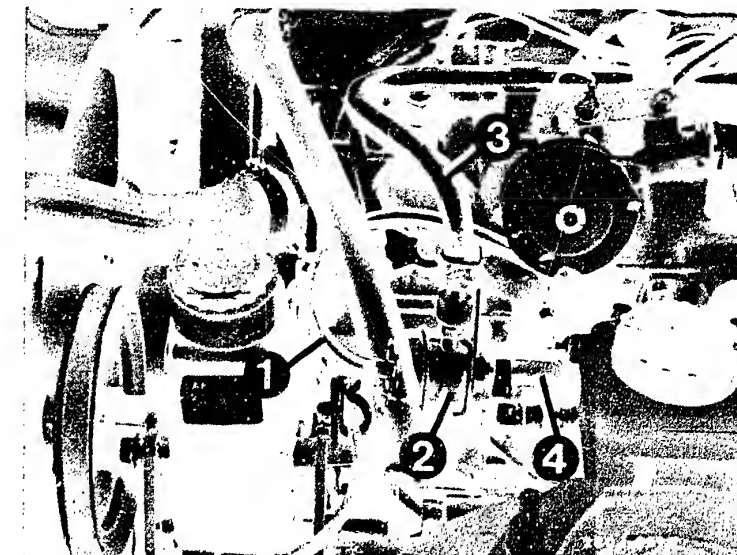
N.B.!

It is absolutely necessary to remove the jumper cable after completion of the test.

Corrective action if the test specification is not being attained:

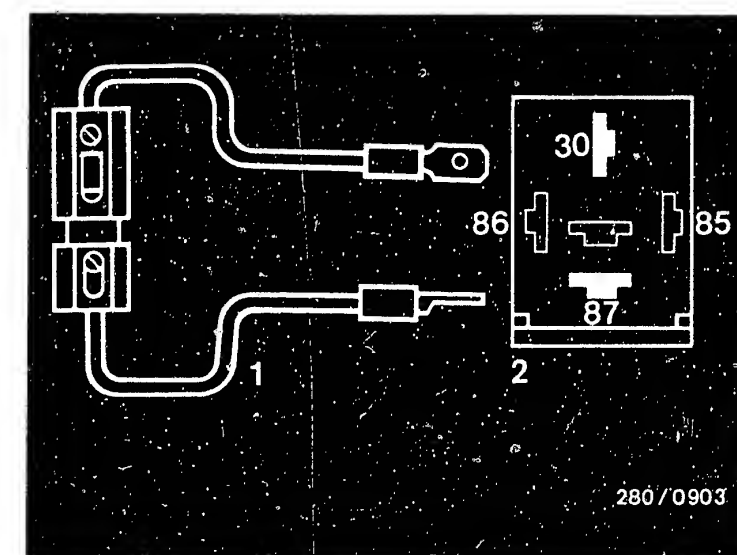
- Fuel filter is clogged: Take it out and replace it.
- Voltage at the connection terminals for the electric fuel pump with the engine running: min. 12 V. If not, clean the contacts and eliminate any poor ground connection. Take out and replace the leads. Check the pump fuses.
- Pressure regulator is defective: Take it out and replace it.

Continued on K21/K22



- 1 = Intake manifold connection
- 2 = Pressure regulator
- 3 = Fuel distribution line (fuel delivery line)
- 4 = Fuel return line

- 1 = Jumper cable with fuse holder and 10 A fuse (user-fabricated)
- 2) Top view of connection socket



**K19**

Insufficient max. engine power  
Volvo 240



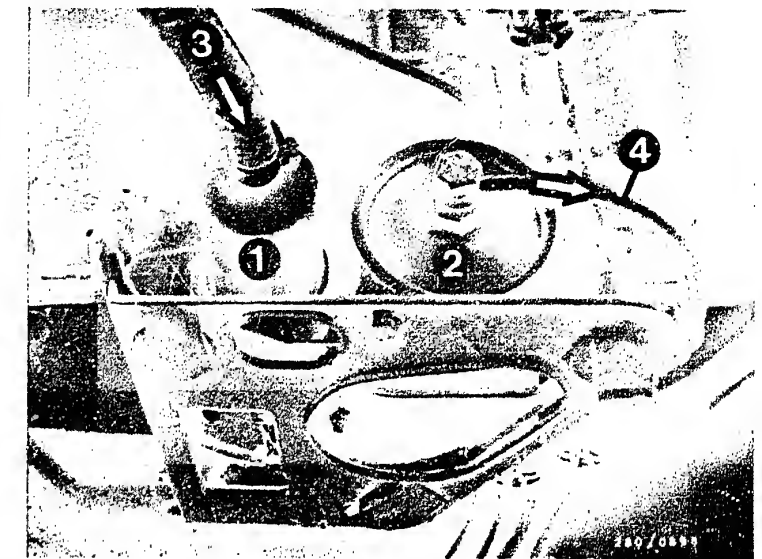
**K20**

Insufficient max. engine power  
Volvo 240



# Insufficient max. engine power or max. velocity (continued)

- Check the pre-supply pump.  
Check by listening:  
Disconnect the connection plug on the electric fuel pump. Ignition "ON", open the air-flow sensor flap by hand.  
The pre-supply pump must run.  
If not, check the connection leads and if need be, take out and replace the pre-supply pump.
- Fuel pump power too low: Take out and replace the fuel pump.  
Testing has been completed: Remove the jumper cable from the connection socket and plug in the pump relay. Reconnect the fuel lines at the pressure regulator and check the connections for leaks.



- 1 = Electric fuel pump
- 2 = Fuel filter
- 3 = Fuel suction line
- 4 = Fuel delivery line

Is the exhaust catalytic converter clogged?

- Comparative measurement of CO
- Time interval for replacement of sensor

No

## Comparative measurement of CO

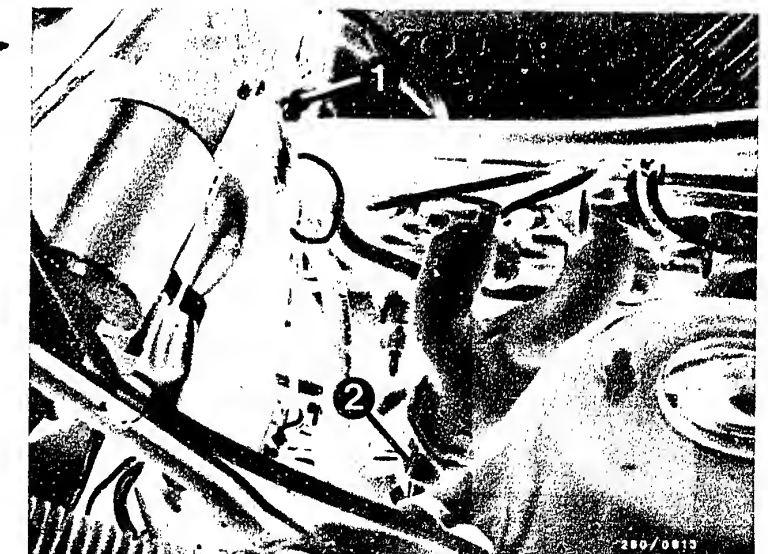
- Release the sensor coupling (open-loop control) and measure the CO-level after the catalytic converter (exhaust end) with the engine at normal operating temperature. Note down the value.
- Unscrew the sensor and in the sensor hole, measure the CO-level before the catalytic converter with the engine at normal operating temperature. (Leaks). Note down the value.
- If the two values are approximately the same, the catalytic converter is clogged and must be taken out and replaced. If the catalytic converter is good, a CO-level less than 0.2 vol % CO is measured at the exhaust end.

Time interval for replacement of the lambda sensor approx. 50 000 km (approx. 30 000 miles). Follow the instructions from the supplier of original equipment.

Yes

Continued on K23/K24

- 1 = Sensor connection
- 2 = Lambda sensor



K21

Insufficient max. engine power  
Volvo 240



K22

Insufficient max. engine power  
Volvo 240





Insufficient max. engine power or max. velocity (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?  
Between Term. 6 and Term. 3:  
 $0...1100\ \Omega$   
Between Term. 5 and Term. 3:  
 $3.6...4.1\ \Omega$

No

Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

Testing:

- Visual inspection:
  - Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
  - Is the wire screen on both sides OK?
  - Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

- Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term 6 and Term. 3:

$0...1100\ \Omega$

Between Term. 5 and Term. 3:

$3.6...4.1\ \Omega$

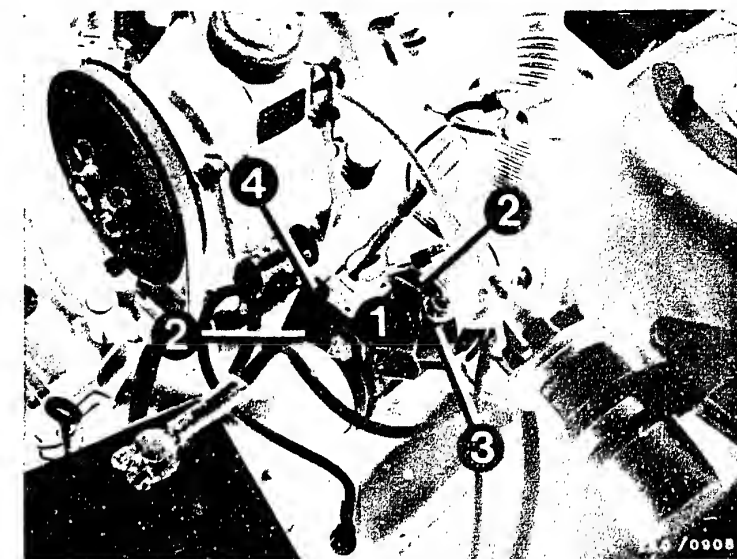
If there are deviations, take out and replace the hot-wire air-mass sensor.

Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak. (Unmetered air!))

Yes

Continued on L1/L2



- 1 = Hot-wire air-mass sensor
- 2 = Hose clamps
- 3 = Bracket
- 4 = Potentiometer for idle-mixture-adjustment

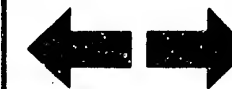
**K23**

Insufficient max. engine power  
Volvo 240



**K24**

Insufficient max. engine power  
Volvo 240



Insufficient max. engine power or max. velocity (continued)

Are all hose lines and electrical lead connections correctly put on?  
Visual inspection.  
Has the intake system been checked for leaks?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

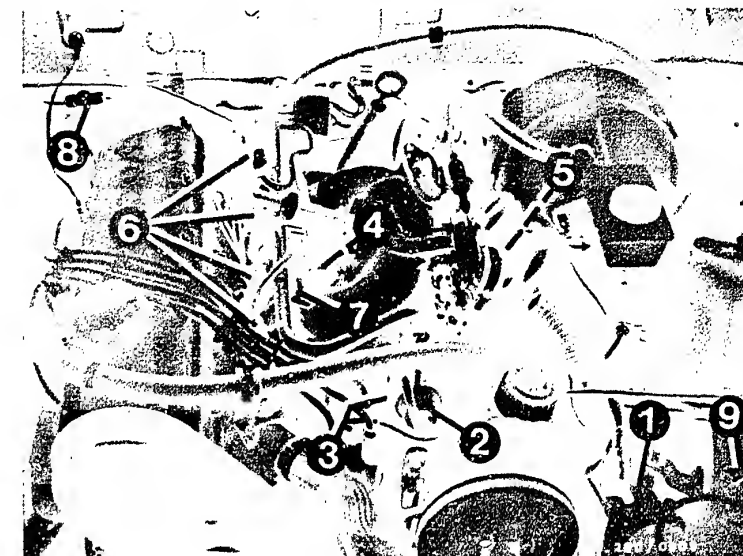
Yes

Trouble-shooting program for the customer complaint  
"Insufficient max. engine power or max. velocity"

has been completed.

Further testing instructions

- Checking the lambda closed-loop control (Coordinates H1...H10)



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection

L1

Insufficient max. engine power  
Volvo 240



L2

Insufficient max. engine power  
Volvo 240



## IDLE SPEED AND CO-ADJUSTMENT TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaint

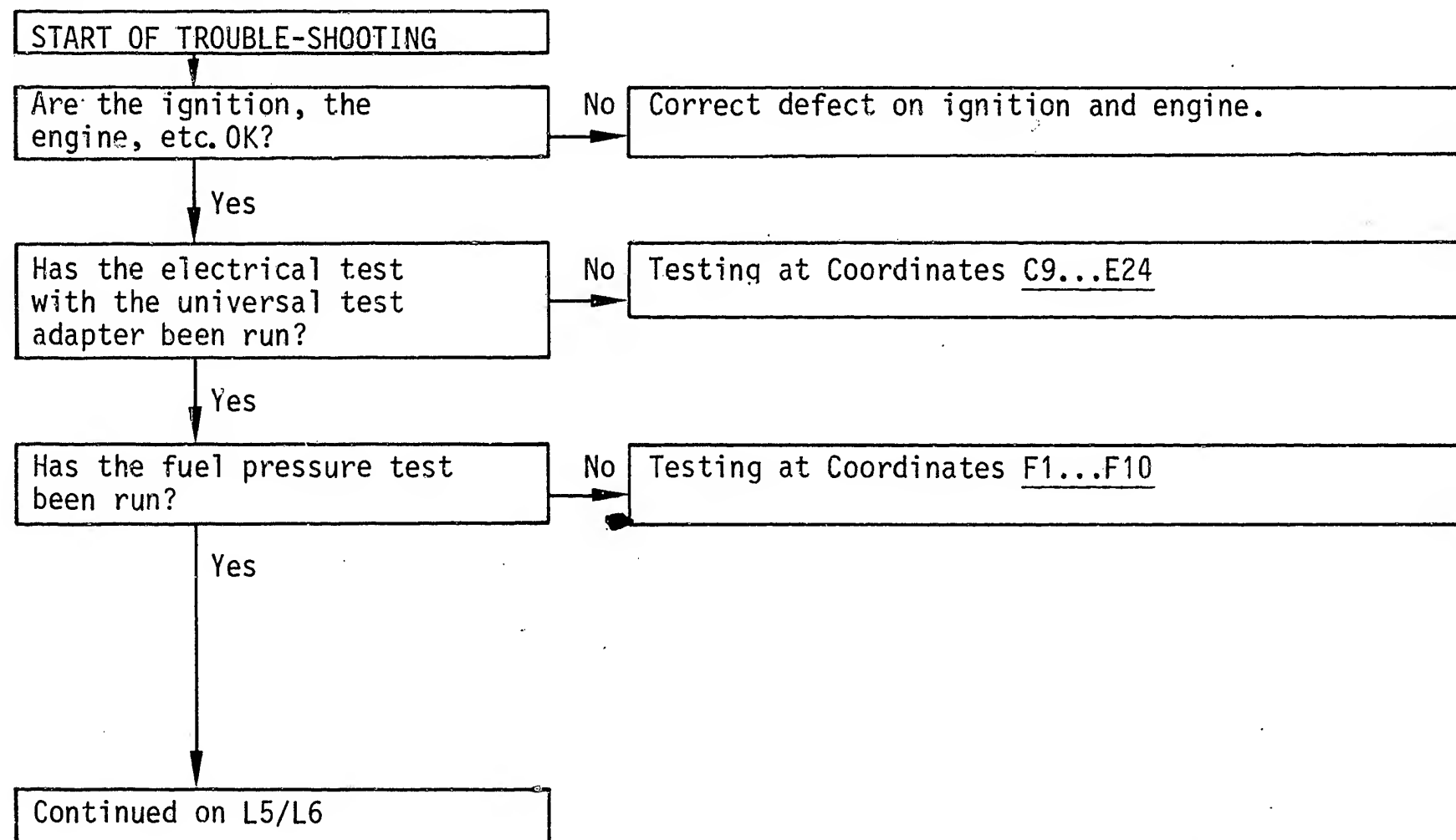
How to use the chart

The testing has been organized into 3 columns of boxes:

- The column at the left contains the questions for tests being run.
- The column at the center describes the component tests and settings.
- The column at the right shows the figures that go with the text, and the legend for the items in the figures.

If it is possible to answer the questions clearly "yes" even without testing, proceed to the next question below.

On the other hand, if the answer is "no" and a defect is suspected, you must branch over to the column at the center and run the tests indicated there. On completion of the testing, the trouble-shooting is continued at the point at which you branched off previously.



**L3**

Idle speed and CO-adjustment  
Volvo 240



**L4**

Idle speed and CO-adjustment  
Volvo 240



Idle speed and CO-level too low or too high (continued)

Yes

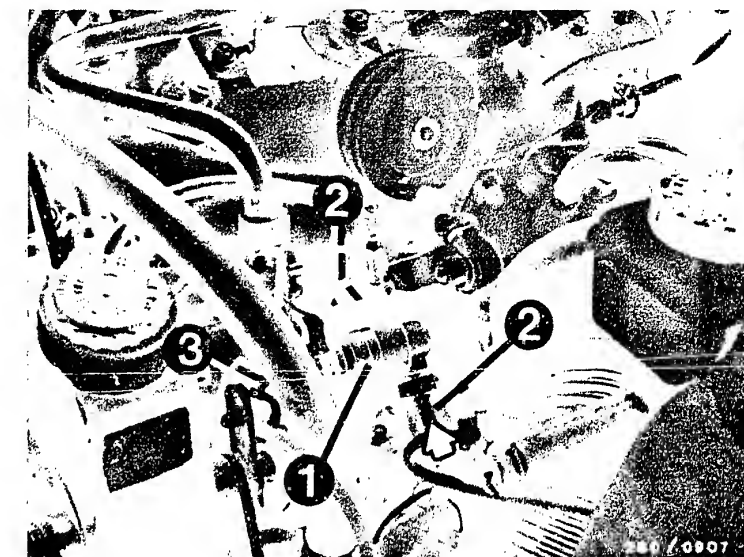
Is the idle actuator OK mechanically?

No

- The idle actuator is tested electrically and functionally using the universal test adapter.
- Mechanical test  
The idle actuator is tested for ease of movement as follows:
  - Take the idle actuator out. (Disconnect hoses.)
  - Disconnect the plug.
  - Join the center connection (Term. 4) to battery voltage.
  - Connect the outer connection (Term. 3) to ground.
  - By visual inspection, find out whether or not the rotary slider turns to the end of stop.
  - Change the outer connection, i.e., connect Term. 5 to ground. The rotary slider must now turn to the opposite stop.If the idle actuator is defective, take it out and replace it.  
When installing the idle actuator, watch the direction of flow through it (arrow).

Yes

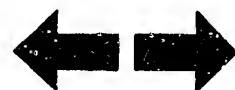
Continued on L7/L8



1 = Idle actuator  
2 = Connection hoses  
3 = Connection plug  
Arrow = Direction of throughflow

**L5**

Idle speed and CO-adjustment  
Volvo 240



**L6**

Idle speed and CO-adjustment  
Volvo 240



# Idle speed and CO-level too low or too high (continued)

Yes

Is the start-control OK?  
(Control unit operation)

- Connect test lead between one solenoid-operated injection valve.
  - Remove plug from temperature sensor II (engine). (White plug)
  - Connect motortester or multimeter to test lead. (Setting V, scale 10 V)
  - Jump the safety circuit. (Power supply for the control unit).
  - Disconnect connecting plug for the other solenoid-operated fuel-injection valves.
  - Start the engine.
- Does the voltage on the solenoid-operated fuel-injection valve drop off during start from approx. 6 V to approx. 0.5 V? (With the engine at normal operating temperature, and the NTC II plug plugged on, the value for voltage is less than 0.5 V.)
- After testing, restore the original condition of installation.

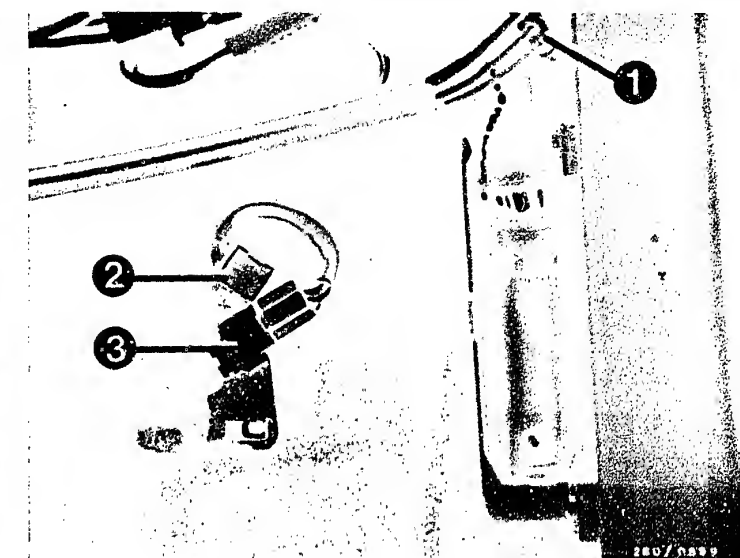
No

Functional test:

- Disconnect the main relay.
- Jump the safety circuit. Insert a jumper cable between Term. 30 and Term. 87 in the connecting socket. (Power supply for the control unit and for the solenoid-operated fuel-injection valves).

Yes

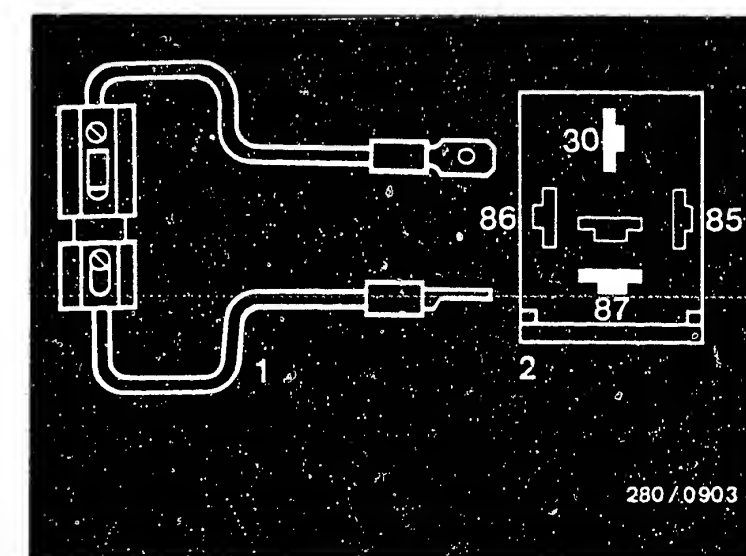
Continued on L9/L10



3 = Main relay

1 = Jumper cable  
Fuse holder and 10 A fuse  
(user-fabricated)

2 = Top view of connection socket



L7

Idle speed and CO-adjustment  
Volvo 240



L8

Idle speed and CO-adjustment  
Volvo 240

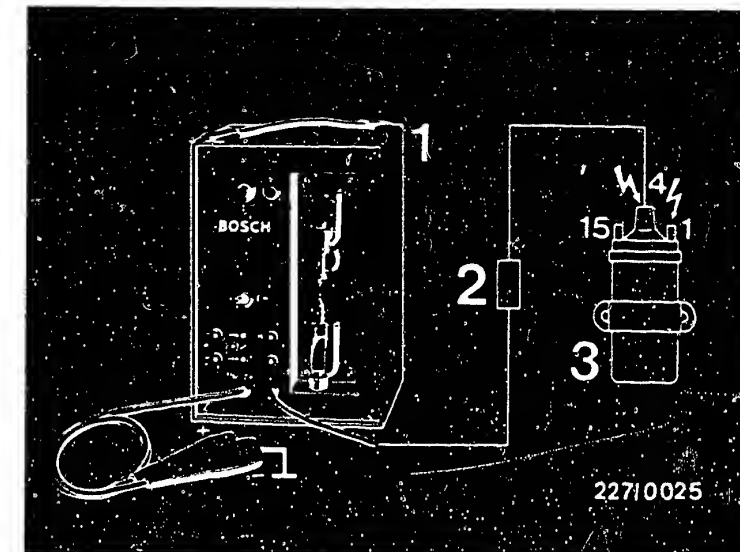


Idle speed and CO-level too low or too high (continued)

- Disconnect the ignition lead Term. 4 from the ignition distributor cap and ground it using a spark gap. (Caution! The engine must not turn over).

Caution:

When using a spark gap, in order to prevent destruction of the trigger box, a suppression resistor of min. 2 k $\Omega$  must be connected up between the spark gap and the ignition coil Term. 6. For example, (5 k $\Omega$ ) sleeve-type suppressor 0 356 500 001.



1 = Spark gap  
2 = Sleeve-type suppressor, 5 k $\Omega$   
3 = Ignition coil (Caution!  
Dangerous voltages, 400 V - 25 kV  
at Term. 1 and Term. 4)

Yes

Continued on L11/L12

**L9**

Idle speed and CO-adjustment  
Volvo 240



**L10**

Idle speed and CO-adjustment  
Volvo 240





Idle speed and CO-level too low or too high (continued)

Yes

- Connect 2-pole adapter lead 1 684 463 093 between one solenoid-operated fuel-injection valve and its electrical connection lead.
- Connect multimeter to the free measurement terminal. Scale approx. 10 V.
- Take out pump fuses No. 5, 7.
- Disconnect lead plug from the temperature sensor II (engine) (white plug)
- Disconnect connection plug for the solenoid-operated fuel-injection valves.

Measurement:

- Start the engine.
- Reading for voltage drops from an initial approx. 6 V to approx. 2.0 V within approx. 10 sec starting time.

If the values for voltage are not attained, take out and replace the control unit.

- Voltage test may not be repeated until after approx. 1 min.

- Plug the lead plug onto the temperature sensor. When the engine is at normal operating temperature, start it. Reading for voltage is less than 0.5 V.

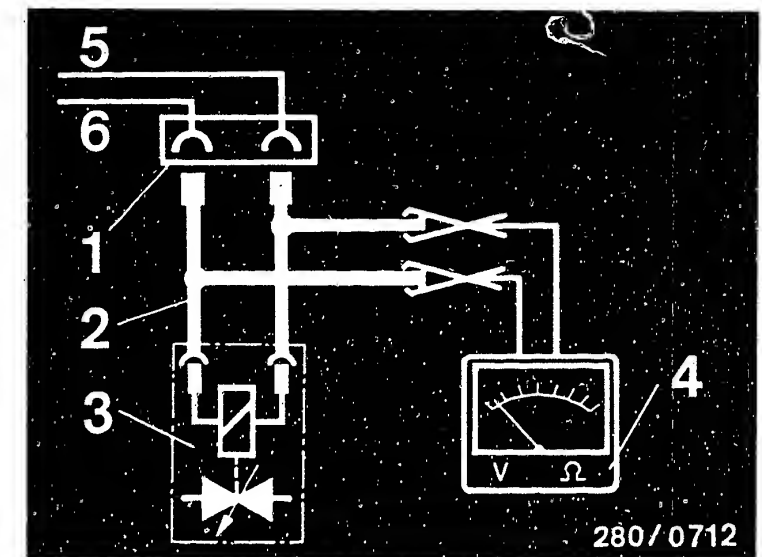
If not, take out and replace temperature sensor II.

Caution!

Do not repeat the test too often because fuel is injected if the solenoid-operated fuel-injection valve is defective (does not close correctly). The engine can run to full speed.

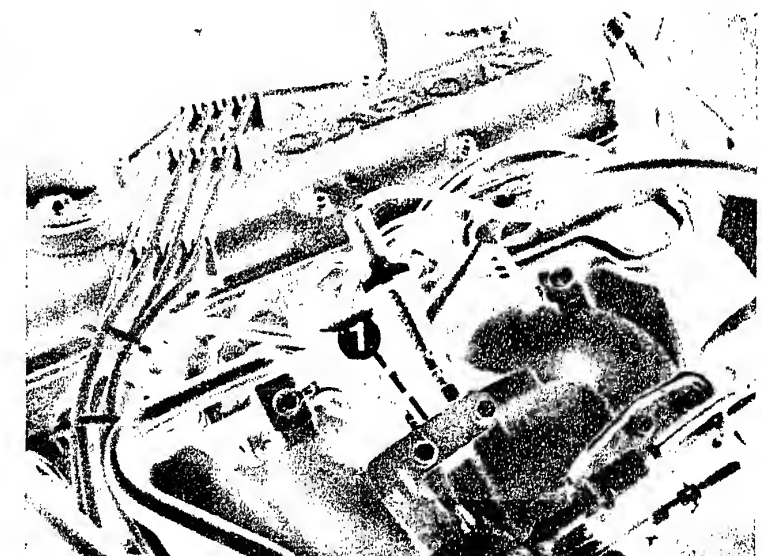
N.B.!

After the test, restore the original condition of installation.



- 1 = Connection plug for the solenoid-operated fuel-injection valve lead
- 2 = Test lead 1 684 463 093
- 3 = Solenoid-operated fuel-injection valve
- 4 = Multimeter or motortester
- 5 = From pump relay Term. 87
- 6 = From control unit Term. 13

- 1 = Temperature sensor II, (engine) on the engine block



Continued on L13/L14

**L11**

Idle speed and CO-adjustment  
Volvo 240



**L12**

Idle speed and CO-adjustment  
Volvo 240



Idle speed and CO-level too low or too high (continued)

Are the solenoid-operated fuel-injection valves OK with respect to leakage?

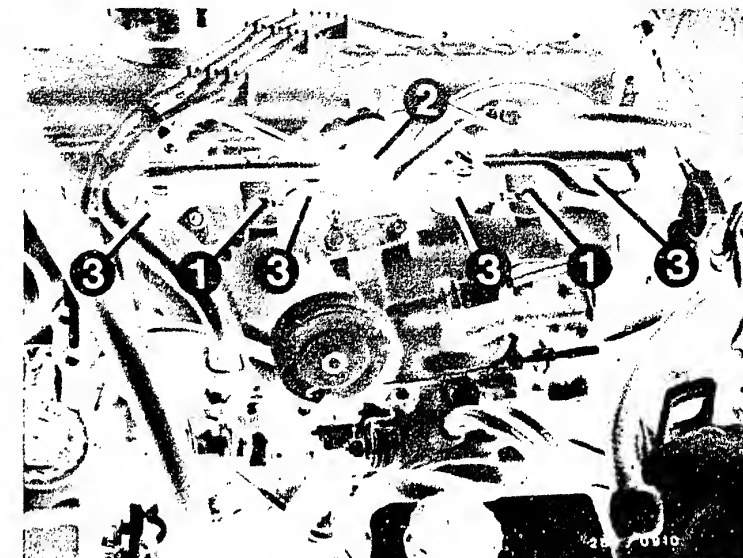
No

Checking the solenoid-operated fuel-injection valves for leaks

- Take out the fuel distribution pipe and the solenoid-operated fuel-injection valves:
  - Disconnect the hose.
  - Release the fastening screws on the fuel distribution pipe and the pressure regulator.
  - Pull all 4 solenoid-operated fuel-injection valves out of the cylinder head simultaneously, and carefully.
- Build up the fuel pressure:  
Jump the safety circuit. The electric fuel pump must run.  
Caution:  
Make certain no fuel gets on hot portions of the engine.
- Test specification:  
No drop may drip from the opening of the solenoid-operated fuel-injection valve within 60 seconds. If there is a defect, take out and replace the solenoid-operated fuel-injection valve.
- Removal:
  - Disconnect the electrical connection.
  - Carefully shove the holding bracket out of the slot.
  - Carefully pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe.

Yes

Continued on L15/L16



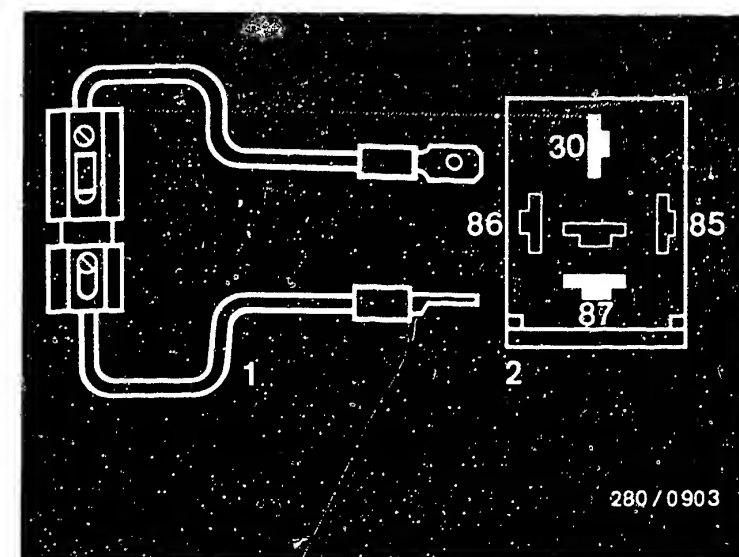
1 = Fastening screws

2 = Hose

3 = Solenoid-operated fuel-injection valves

1 = Jumper cable with fuse holder and 10 A fuse (user-fabricated)

2 = Top view of connection socket



**L13**

Idle speed and CO-adjustment  
Volvo 240



**L14**

Idle speed and CO-adjustment  
Volvo 240



Idle speed and CO-level too low or too high (continued)

Yes

Caution: Catch fuel that escapes. Do not allow it to drip onto hot portions of the engine.

Caution!

Before the two O-rings are put in, they may be greased only lightly (silicone grease Ft 2 v 1). The other parts of the solenoid-operated fuel-injection valve must remain free of grease.

● Installation

- Carefully put new solenoid-operated fuel-injection valve onto the fuel distribution pipe.
- Shove the holding bracket into the slot until it catches. (Check the connection for leaks.)

Caution!

After testing, restore the original condition of installation. (Put in the hose.) Check for leaks (unmetered air).

Continued on L17/L18

**L15**

Idle speed and CO-adjustment  
Volvo 240



**L16**

Idle speed and CO-adjustment  
Volvo 240



Idle speed and CO-level too low or too high (continued)

Yes

Is the hot-wire air-mass sensor OK mechanically and electrically?

- The hot-wire is not broken?
- Are resistances within tolerances?

Between Term. 6 and Term. 3:  
0...1100  $\Omega$

Between Term. 5 and Term. 3:  
3.6...4.1  $\Omega$

No

Removal:

- Remove hose clamps on the hot-wire air-mass sensor and disconnect.
- Release the bracket.

Testing:

• Visual inspection:

- Connecting plug correctly put on. Spring clamp snapped in. Plug not twisted. No plug blades pushed back, or poor contact. Watch that the gasket in the connecting plug is seated properly.
- Is the wire screen on both sides OK?
- Is the hot wire broken? If yes, take out and replace the hot-wire air-mass sensor.

• Electrical test:

- Disconnect connecting plug. Set multimeter or motortester to the  $\Omega$  range.

Measurement of resistance between Term. 6 and Term. 3:

0...1100  $\Omega$

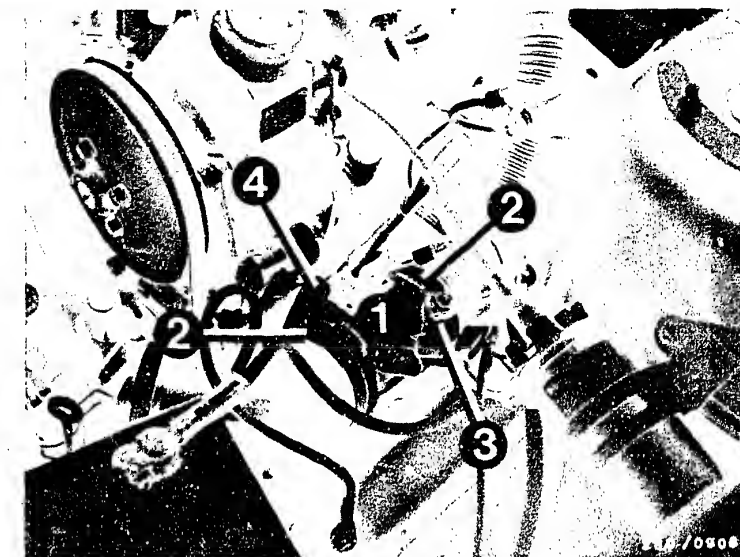
Between Term. 5 and Term. 3:

3.4...4.1  $\Omega$

If there are deviations, take out and replace the hot-wire air-mass sensor.

Installation

- Put connecting plug on correctly (good contact).
- Fasten the hot-wire air-mass sensor to the bracket.
- Put on the hoses and tighten the hose clamps on the hot-wire air-mass sensor. (Make certain the connection does not leak. (Unmetered air!))



- 1 = Hot-wire air-mass sensor
- 2 = Hose clamps
- 3 = Bracket
- 4 = Potentiometer for idle-mixture-adjustment

Yes

Continued on L19/L20

**L17**

Idle speed and CO-adjustment  
Volvo 240



**L18**

Idle speed and CO-adjustment  
Volvo 240



Idle speed and CO-level too low or too high (continued)

Has the intake system been checked for leaks?

- Has the air intake system been checked for leaks using 0.3 bar over-pressure?

No

Check that the hoses in the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take put and replace hoses. Correct leaks by using new gaskets or by tightening the connection screws.

Testing for leaks:

Seal off the exhaust pipe, unscrew the hose from the air filter to the air-mass sensor at the air-mass sensor and seal the air-mass sensor channel. (Dust cover). Disconnect the hose after the idle actuator. Seal off the idle actuator connection. Using a compressed air gun, blow air (0.3 bar) into the hose to the intake manifold. When doing so, open the throttle valve all the way. Brush or spray all joints with soapy water. Bubbling or foaming indicates leaks.

Caution!

Put all hoses back on and tighten hose clamps firmly. Check for leaks.

Yes

Trouble-shooting program for the customer complaint

"Idle speed and CO-level too low or too high"

has been completed.

Further testing instructions

- Checking the lambda closed-loop control (Coordinates H1...H10)



- 1 = Hot-wire air-mass sensor
- 2 = Pressure regulator
- 3 = Idle actuator
- 4 = Temperature sensor II (engine)
- 5 = Throttle valve switch
- 6 = Solenoid-operated fuel-injection valves
- 7 = Ground terminals
- 8 = Sensor lead (disconnecting clamp)
- 9 = Test connection

L19

Idle speed and CO-adjustment

Volvo 240



L20

Idle speed and CO-adjustment

Volvo 240



# After-sales Service

## Technical Bulletin

28

Only for use within the Bosch organization. Not to be communicated to any third party.

### EXCHANGEABLE NON-RETURN VALVES

on electric fuel pumps 0 580 464 ..

VDT-I-280/107 En

3.1983

(Replaces Ed. 9.1981)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 364 002	---	1 583 386 011	1 580 203 001
0 580 464 005	---	1 583 386 008	001
006		008	001
007	---	008	001
009	---	008	001
010	---	008	001
017	1 587 010 002		
018	007		
021	006		
022	007		
024	006		
025	007		
027	006		

**BOSCH**

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**N1**

Technical Bulletin

Volvo 240





# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

DETERMINATION OF THE TEMPERATURE VALUES  
GIVEN IN L-JETRONIC MANUALS

VDT-I-280/108 En  
5.1982

We have recently been asked with increasing regularity how accurately the engine temperature must be measured when trouble-shooting on the vehicle.

So far in its L-Jetronic manuals KH/VSK has given three or four different temperatures for testing the temperature sensor:

-10 °C, +20 °C, +40 °C and +80 °C,

and two ranges for the thermo-time switch e.g. 35 °C 8 sec.

below +30 °C and above +40 °C.

Since the temperature range need not be subject to such close tolerances, we propose in future the following more appropriate definition:

- Ambient temperature (approx. +15 °C to +30 °C)
- Engine at normal operating temperature (approx. +80 °C).

Please direct questions and comments concerning the contents to our authorized representative in your country.

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**N2**

Technical Bulletin

Volvo 240



# After-sales Service

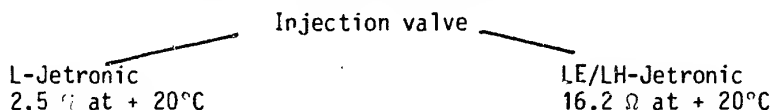
## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

CODING OF LE/LH-JETRONIC  
SOLENOID-OPERATED INJECTION VALVES

VDT-I-280/109 En  
5.1982

With the introduction of the LE/LH-Jetronic the internal resistance of the solenoid-operated injection valves has also been changed.



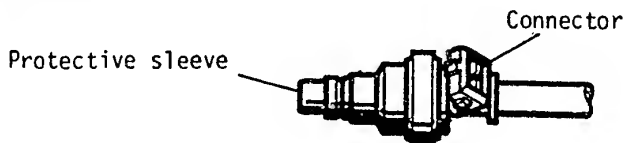
The connector has been left the same for cost reasons and to meet customer wishes.

### Caution!

If L-Jetronic injection valves are installed in an LE/LH-Jetronic vehicle, either the control unit or the injection valves will suffer irreparable damage.

### Note:

- Install only injection valves with the part number designated for the vehicle.
- As a guide, injection valves with 16.2  $\Omega$  internal resistance have a yellow protective sleeve.



- A colour coding (yellow) of the connector (see also VDT-I-280/5) is not generally intended for LE/LH-Jetronic injection valves.

Please direct questions and comments concerning the contents to our authorized representative in your country.

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**N3**

Technical Bulletin

Volvo 240



# After-sales Service

## Technical Bulletin

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28

VDT-I-280/110 En

6.1983

PARTS SET FOR INJECTION VALVES

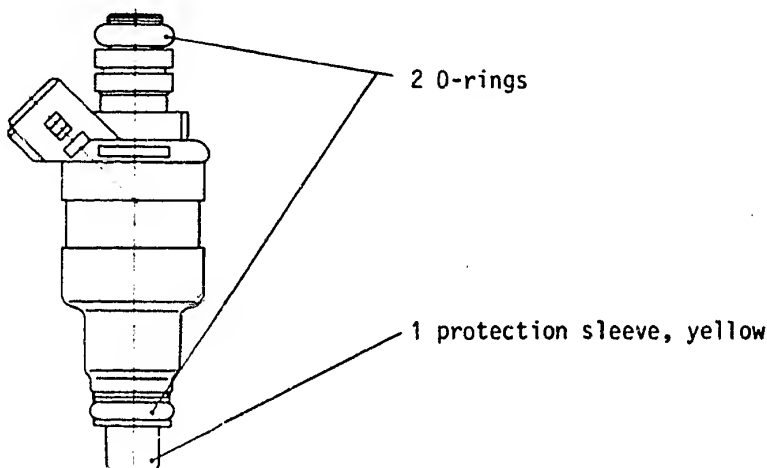
Supersedes 6.1982 edition

0 280 150 2..

AND PRESSURE REGULATORS 0 280 160 2..

A common parts set is available for the L-Jetronic/LE-Jetronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for 1 pressure regulator:

1 O-ring

1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 under 0 280..).

Please direct questions and comments concerning the contents to our authorized representative in your country.

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PLUG CONNECTORS FOR  
JETRONIC COMPONENTS  
Parts sets

VDT-I-280/111 En

11.1984

(supersedes edition 11.1982)

Parts sets are available for replacement of Jetronic plug connectors. These consist of:

- Plug connector housing
- Protective cap (rubber sleeve)
- Contact springs

These parts are listed on microfiche EE...\*.

\* see microfiche EE00 under 0 280 ..

- Plug, black, 2-pin,  
parts set 1 287 013 002 cable connector in conjunction with socket, 2-pin
- Socket, black, 2-pin,  
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- Socket, grey, 2-pin  
parts set 1 287 013 003 for:

Solenoid-operated injection valve	0 280 150 ..
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- Socket, black, 3-pin,  
parts set 1 237 000 039 for:

Throttle-valve switch 0 280 120 ..

- Socket, black, 5-pin,  
parts set 1 287 013 006 for:

Air-flow sensor 0 280 20. ..  
(LE version)

- Socket, black, 6-pin,  
parts set 1 287 013 004 for:

Air-flow sensor 0 280 200 ..

- Socket, black, 7-pin,  
parts set 1 287 013 005 for:

Air-flow sensor 0 280 20. ..  
Air-mass sensor 0 280 211 ..

- Wiring-harness plug connector, black, 25-pin  
parts set 1 287 013 009 for:

Control unit 0 280 0..

- Wiring-harness plug connector, black, 35-pin,  
parts set 1 287 013 008 for:

Control unit 0 280 0..

The contact springs (minitimers) are also available separately under part no. 1 284 477 026.

The plug-connector housings are only available in the stated colours.

Responsible:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.



# After-sales Service

## Motor Vehicle Service Information

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### UNIVERSAL TEST ADAPTER

VDT-I-Gen. 1001 En  
1.1982

#### 1. Application

The multiplicity of different fuel-injection and ignition systems at present available on the market, as well as the advances in development which can be expected in the future, demand a new testing concept. In order to maintain the outlay for test equipment, and hence the costs, at a reasonable limit we have developed the universal test adapter.

The following systems can be tested using a test-adapter universal unit together with adapter leads suited to the system in question:

##### 1.1 Systems which are already being fitted as series:

- L-Jetronic (1st generation)
- LE-Jetronic (2nd-generation L-Jetronic)
- Motronic (with the new connector designation, refer to the vehicle-specific instructions!)

##### 1.2 Systems whose introduction is planned:

- Motronic with gearbox control
- KE-Jetronic
- Mono-Jetronic
- Electronic ignition system with ignition map (EZF)

#### 2. Delivery dates and Part Numbers

Available as from 2.1982.

##### 2.1 Universal test adapter (basic unit)

Part Number: 0 684 101 801

Designation: ETT 018.01

##### 2.2 System adapter lead for LE-Jetronic (2nd-generation L-Jetronic)

Part Number 1 684 463 123

First application: For BMW 2.5/2.8 l engines as from 9.1981, and for Opel 2.0 l engines (Manta/Rekord) as from 9.1981.

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Motor Vehicle Service Information  
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### 2.3 System adapter lead for Motronic with new connector assignment.

(Refer to the vehicle-related instructions!)

Part Number : 1 684 463 124

First application: Porsche 944 as from series production, BMW as from about 3.1982 (Europe)

### 2.4 System adapter lead for L-Jetronic (in preparation)

Further system adapter leads will be made available along with the introduction of the new systems as mentioned above.

### 3. Testing procedure

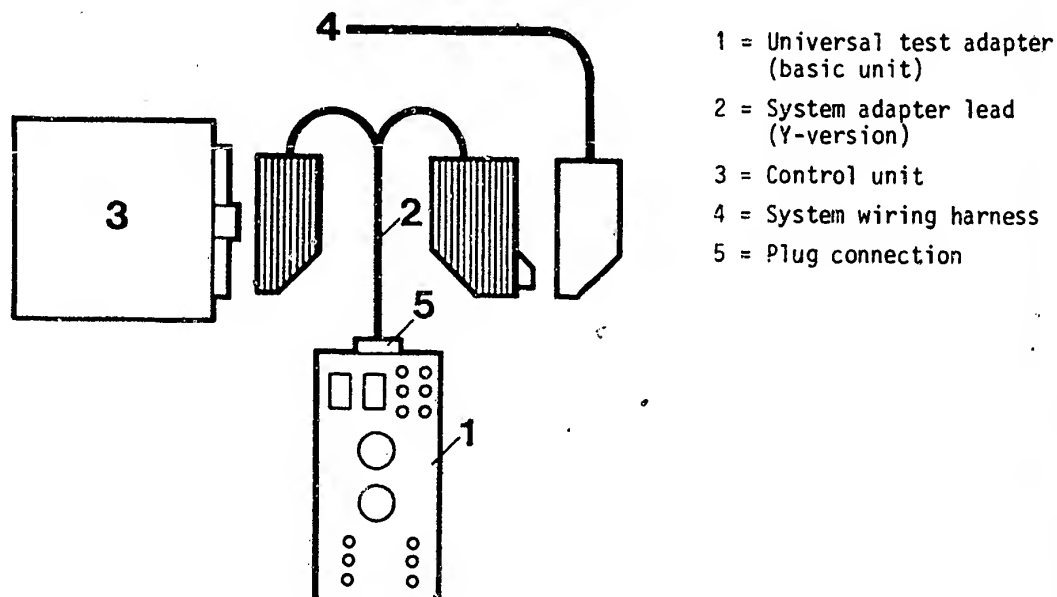
The systems and the components are tested for voltage and resistance values as well as for correct functioning. Evaluation is by means of a multimeter and the Motortester which are connected into the universal test adapter.

Depending upon the complexity of the system, interchangeable adapter lead model 1 or model 2 is provided:

#### 3.1 Adapter lead for peripheral and function testing (Model 1)

The universal test adapter together with the system adapter lead is to be connected to the system wiring harness and to the control unit (e.g. Motronic).

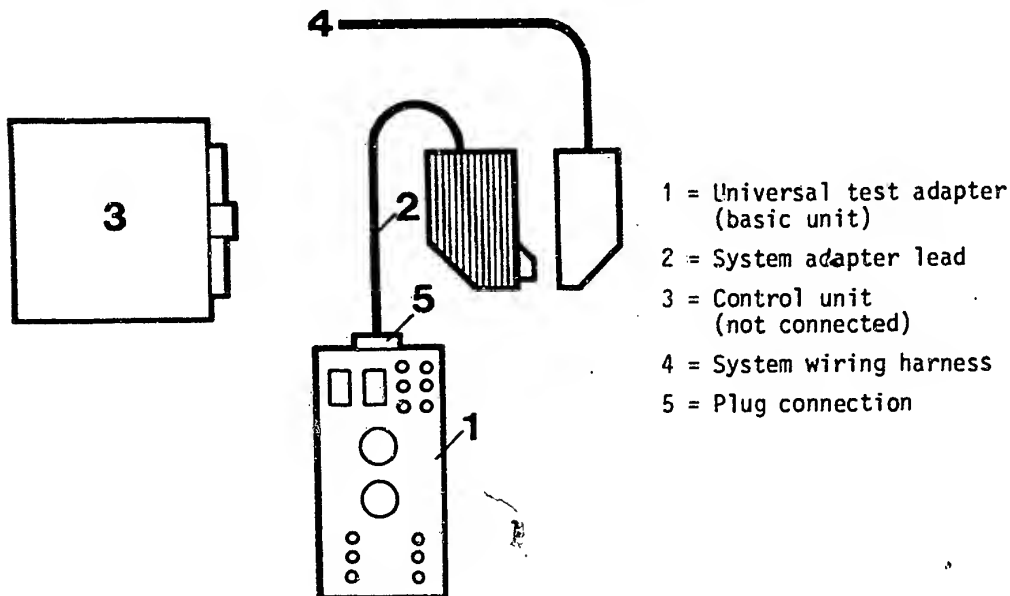
To be tested: Wiring harness with components and control unit.



### 3.2 Adapter lead for peripheral testing (Model 2)

The universal test adapter with system adapter lead, is only to be connected to the system wiring harness (e.g. LE-Jetronic (2nd-generation L-Jetronic)).

To be tested: Wiring harness with components (without control unit).

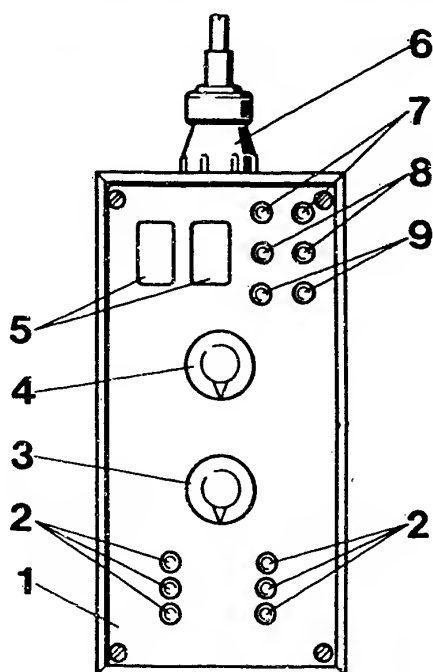


### 4. Construction of the universal test adapters

The universal test adapter is fitted with 2 program switches footlage and resistance measurement. The measured values are displayed on the multimeter connected to the universal test adapter. For reasons of safety, the voltage and resistance sockets are separated. In order to measure signals (e.g. injection pulses, ignition pulses), it is necessary to connect a Motortester to the measuring cavities (special input).

When carrying out functional tests with the control unit connected, selected push-buttons are pressed in a number of test-program steps in order to simulate a variety of different engine operating conditions the influence of which is evaluated using the Motortester.





- 1 = Universal test adapter (basic unit)
- 2 = Keyboard for simulation of various conditions e.g. engine temperature, throttle position etc.
- 3 = Program switch "Ohm" for resistance measurement
- 4 = Program switch "Volt" for voltage measurement
- 5 = Measurement "cavities" (for the special input from the Motortester)
- 6 = 63-pole plug-in connection for connecting the system adapter lead
- 7 = Measurement sockets (voltage measurement with a multimeter or with the Motortester)
- 8 = Measurement sockets (resistance measurement with the multimeter)
- 9 = Sockets for special functions (not yet allocated)

Notes:

1. The Motronic test adapter (0 684 101 800, ETT 018.00) will continue to be used for Motronic-equipped BMW vehicles (with old connector assignment) up to about year of manufacture 3.1982 (refer to vehicle-specific instructions).
2. Details on the operation of the universal test adapter, and the test specs, are to be found in the vehicle-specific after-sales service instructions.

3. Caution! Change of Part Number:

On the SIS-microfiches OPE-00/J22 (Coordinates A14 and A17) the new Part Numbers are as follows:

Universal test adapter: 0 684 101 801

Adapter lead : 1 684 463 123



# After-sales Service

## Motor Vehicle Service Information

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EXPORT VEHICLES WITH  
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.

12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

The vehicle-related After-Sales Service Instruction Manual for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

\* Not made by Bosch

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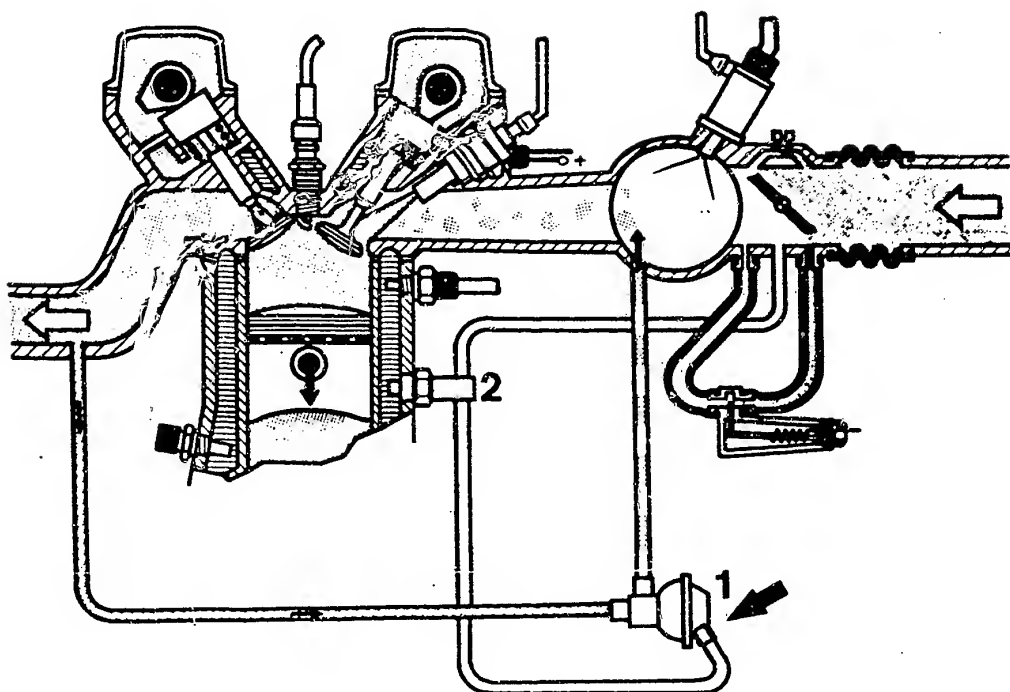
**N11**

Motor Vehicle Service Information

Volvo 240



## 1. Exhaust-gas recirculation (EGR)

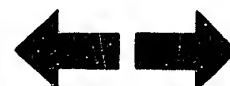


1 = Exhaust-gas recirculation valve      2 = Thermo-valve

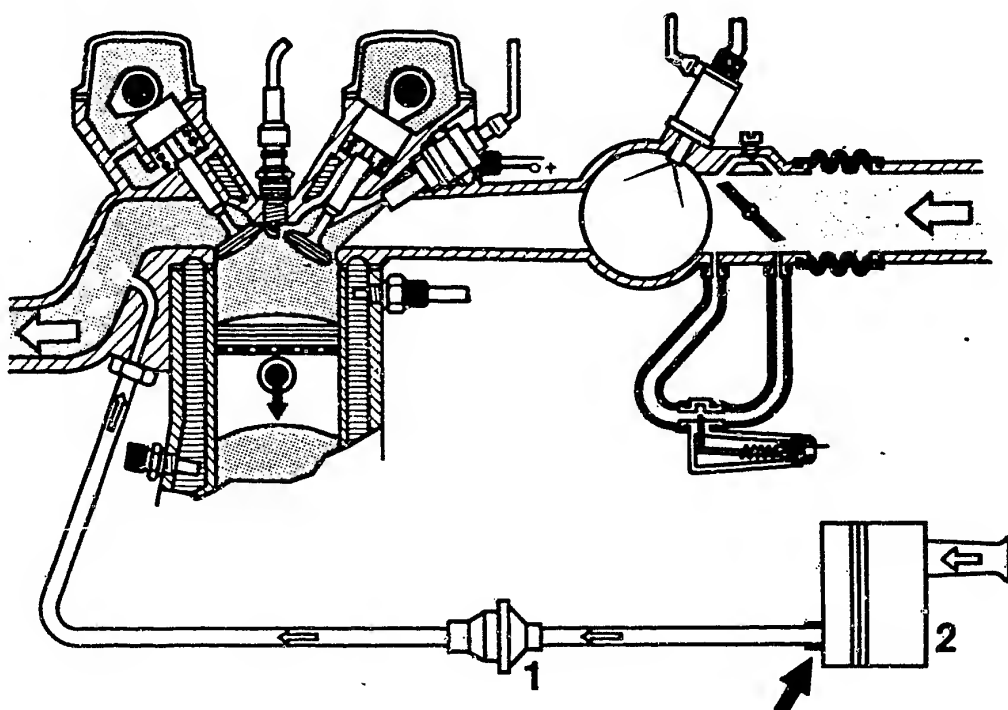
Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NO<sub>x</sub>). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min<sup>-1</sup>. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.



## 2. Secondary-air induction (e.g. Volvo Pulsair system)



1 = Non-return valve

2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

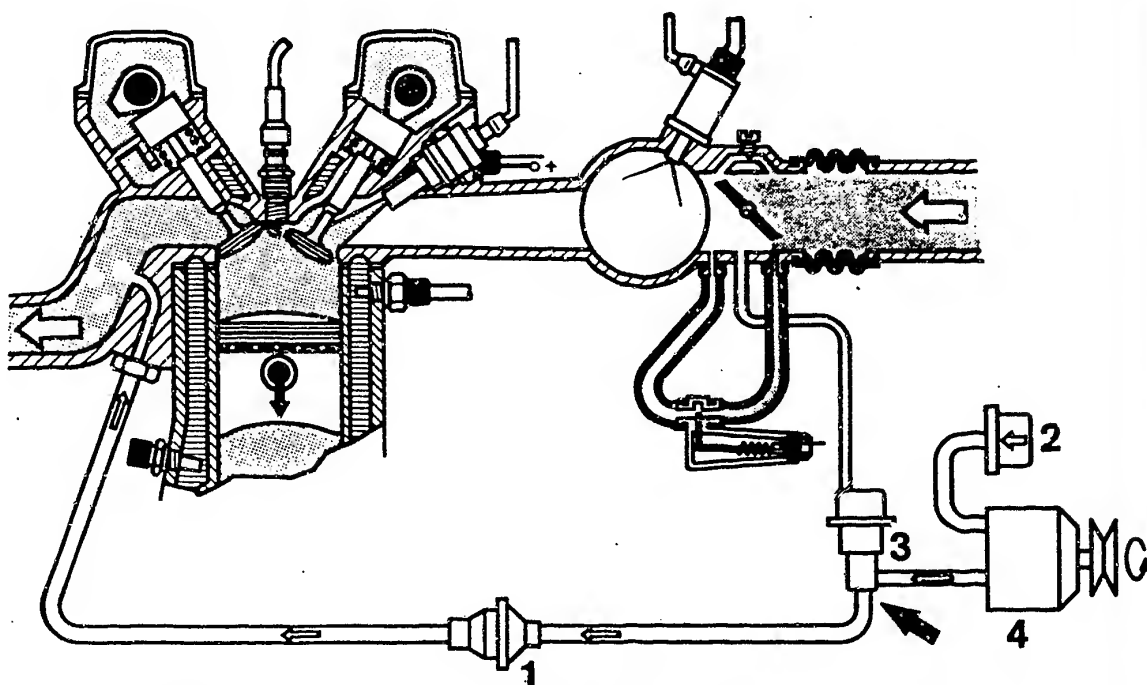
When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.





### 3. Secondary-air injection



1 = Non-return valve

3 = Change-over valve

2 = Air filter

4 = Air pump

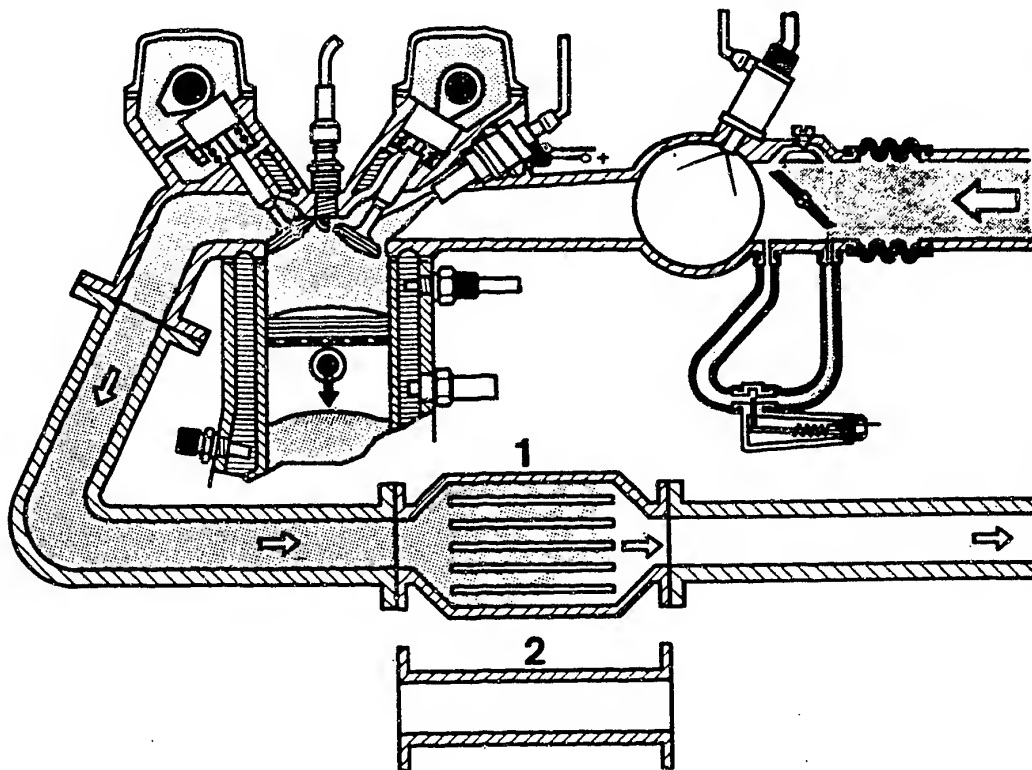
An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.



#### 4. Catalytic converter



1 = Catalytic converter

2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NO<sub>x</sub> to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.

Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

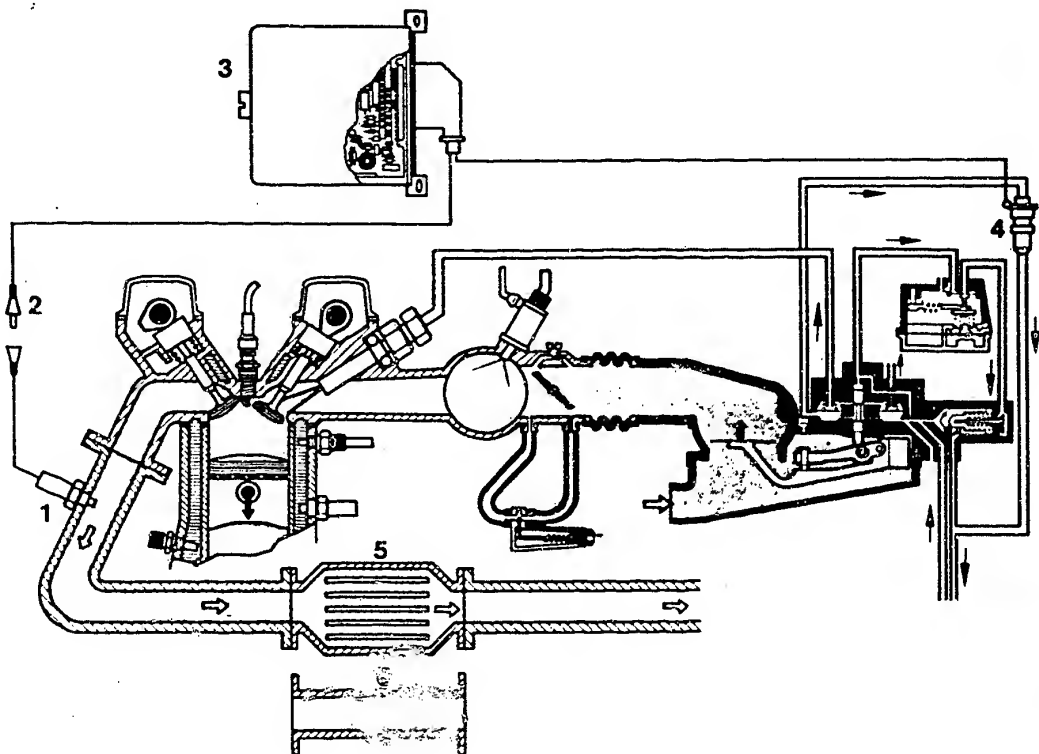
#### Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.



## 5. Lambda closed-loop control



1 = Lambda sensor  
2 = Plug

3 = Control unit  
4 = Timing valve

5 = Catalytic converter  
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.

If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

### Caution!

Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.

The catalytic converter should be replaced by an intermediate pipe.

Published by:  
Robert Bosch GmbH  
Division KH  
After-Sales Service Department  
for Training and Technology  
(KH/VSK)



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Automotive Equipment - After-Sales Service  
Department for Technical Publications KH/VDT  
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service  
Department for Training and Technology (KH/VSK).  
Published: 8.1988

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